AUSTRALIAN
communications

APRIL 1994 The Networking and Telecommunications Management Magazine $5.50

THE GREAT SPACE CRUSH

What will the boom in Asia-Pacific satellite capacity mean for business communications?

V.FAST MODEMS

Off to a very fast start — but can they deliver?

LAN ANALYSERS

Heavy on features, but just how accurate are they?

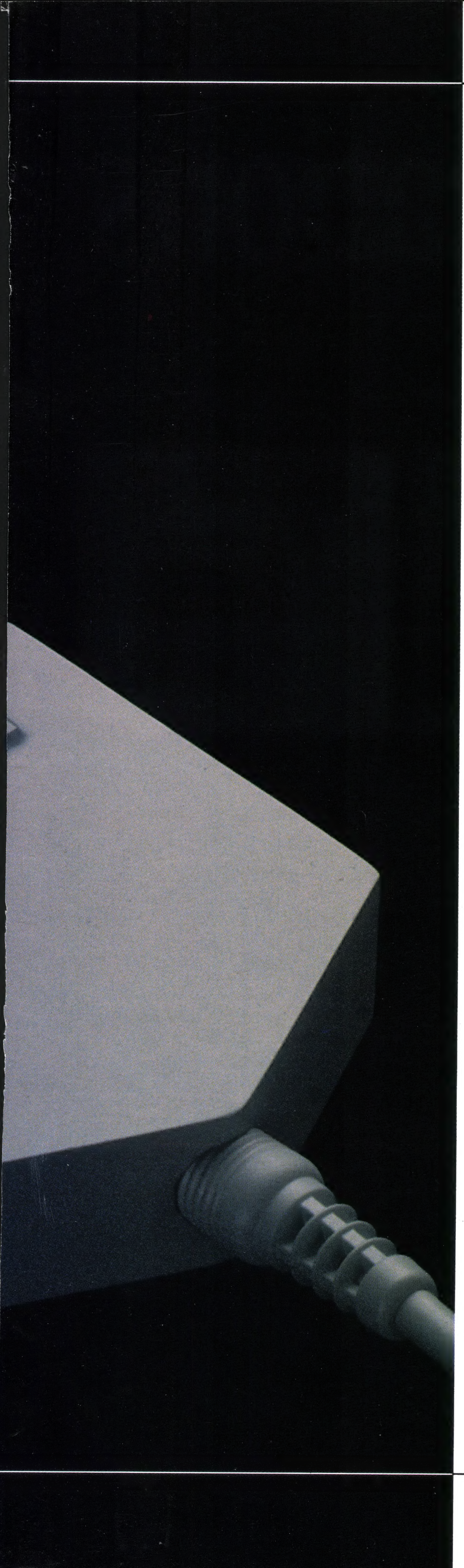
HIGH-END ROUTERS

Cisco and Wellfleet top our comparative performance tests

THE SNMP OVERLOAD

How mid-level managers can weed out irrelevant SNMP updates

EXICOM



MANUFACTURING

FOR WORLD CLASS TELECOMMUNICATIONS WE MADE A VERY SMART CONNECTION.

Two years ago we formed a unique alliance with Exicom, Australia's largest domestically-owned company specialising in telecommunications.

As a result, we are delivering innovative telecommunications products and services to our customers throughout the world.

On the manufacturing front, Exicom is producing key value-added products that are generating sales for NorTel both here and overseas.

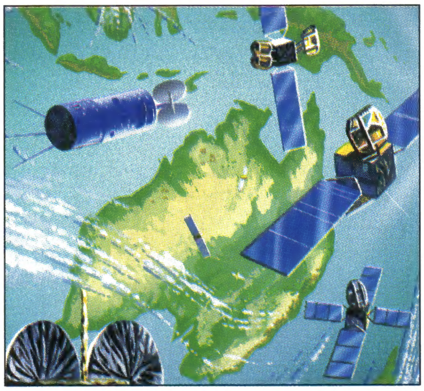
By combining our strengths, we've contributed to each other's success.

And it's a business connection that's paying dividends for Australia too.

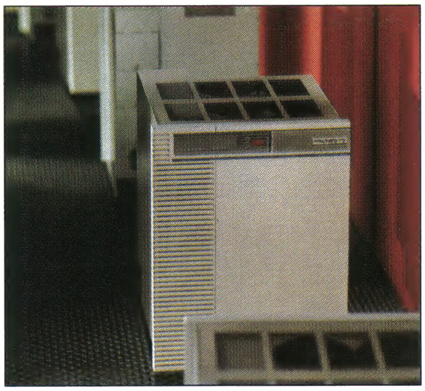
NorTel. Discovering and delivering the world's best solutions in telecommunications.

nt nortel

AUSTRALIAN
communications



Cover: Tony Pyrzakowski



SATELLITES 69

Backed by national governments, upstart entrepreneurs and large multinationals, a scramble to launch satellites in the Asia-Pacific orbital arc is precipitating a competitive services market which promises lower tariffs for customers and plenty of opportunities for equipment suppliers. By the end of next year, Australia will be 'seen' by a host of new spacecraft from the US, China, Hong Kong, Japan, Indonesia, Russia and Tonga, with others planning to follow — or to get there first. With beams of varying size, shape and power, private operators will launch a range of new offerings, from voice and data to high-end video services.

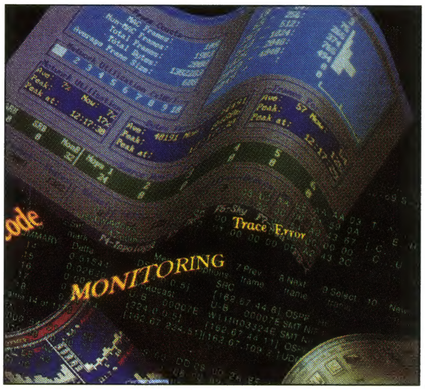
V.FAST MODEMS 81

After a lengthy gestation period, the ITU's new V.fast high-speed modem specification has at last been scheduled for a mid-year release. Stewart Fist takes a look at the development of high-speed technologies, culminating in the new breed of 28.8Kbps V.fast, V.fast Class and V.32-terbo modems. Discounting the overblown marketing hype put about by some vendors, the technical achievements have nevertheless been quite extraordinary — the most remarkable of all perhaps being that this time around high data rates with compression and error correction have been incorporated right from the start in reasonably priced, production-line units.

HIGH-END ROUTERS 89

The names Cisco and Wellfleet are synonymous with routing, and as this latest round of Data Comm Test Lab performance testing indicates, both companies are working hard to maintain their market-leading positions. Of the routers evaluated, Cisco's AGS+ and Wellfleet's Backbone Concentrator Node ran the fastest, no matter how much traffic or how many different protocol mixes were thrown at them. In fact, the tests show there's good news all round for router vendors, with high marks scored for performance as well as essential features like fault tolerance and management. Configuration, however, remains a sore point.

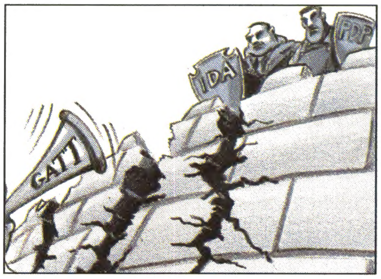
APRIL 1994



LAN ANALYSERS 99

All the bells and whistles loaded onto a network analyser aren't worth much if the box can't do its main job properly. The latest round of Data Comm Test Lab results reveal that accuracy between units can differ greatly. To separate the wheat from the chaff, the Lab's technicians made a thorough evaluation of several analysers and frame generators — and the results confirmed suspicions that performance can vary widely from analyser to analyser. Some boxes reported incorrect information even on networks bearing only a light load, yet gave no indication that their counts were off. We reveal the winners and losers in this year's comprehensive analyser roundup.

ANALYSIS



23 Will the Walls Tumble Down?
What impact will the completion of the Uruguay Round of GATT negotiations have on Australia's industry development schemes?

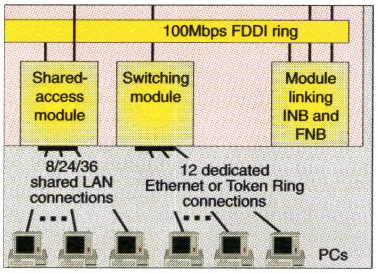
24 Stock Watch
25 Telcos Discover TINA
26 The Next Round of US Reforms
29 Yet Another Lobby Group

TECHNOLOGY

33 Mid-Level SNMP Managers
Weeding out irrelevant Simple Network Management Protocol updates helps central consoles pay attention to what's reallly important.

34 Market Watch
36 MPTN Means Multiprotocol
40 The E-Mail Integration Puzzle
43 LAN Views — Graeme Le Roux
44 Open Systems — Alan Lloyd
46 Technology Update

PRODUCT LEADERS


100Mbps FDDI ring
Shared-access module
Switching module
Module linking INB and FNB
8/24/36 shared LAN connections
12 dedicated Ethernet or Token Ring connections
PCs

51 Segue Into Switched Networking
Cabletron's MMACplus hub offers a smooth migration path from shared-access local area networks to high-speed switched connections.

52 Chipcom's Unkillable Hub
Chipcom has gained a large slice of the hub market by concentrating on fault tolerance. Not surprisingly, it's new ONcore hub is unstoppable.

53 ADC Fibermux Snaps Up LANs
ADC's new range of stackable hubs are a 'snap' to put together and can support mixed Ethernet and Token Ring local area networks.

OPINION

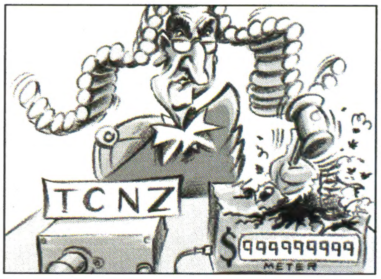
66 Tom Amos contends that market liberalisation should always go hand in hand with privatisation. We've had liberalisation, so guess what's next?

67 Warwick Smith, newly appointed Telecommunications Industry Ombudsman, outlines the issues his organisation has set its sights on.

INTERVIEW

63 John Rohan
John Rohan joined Vodafone last year after 26 years in the electronics and construction industries. Liz Fell asked him about the difficulties of building our third mobile network.

LEGAL LINE

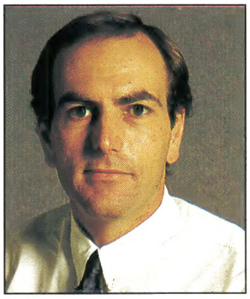


61 A Clear Interconnect Deal
The recent court battle between Clear Communications and TCNZ over interconnect charges revolved around the issue of access pricing. Brent Fisse reviews the decision.

DEPARTMENTS

VIEWPOINT 6
LETTERS 10
UPDATE 16
ATUG'94 PREVIEW 55
PRODUCT FILE 113
THE ATUG PAGES 123
CALENDAR 130

The Sky-High Revolution



It was only a few short years ago that some pundits were postulating that the golden age of satellites was already drawing to a close, superseded by the new web of fibre optic cables encircling the globe. But while it's true that satellites can never match the speed and capacity of fibre, the current boom in planned and actual satellite construction and deployment indicates that the technology still has a bright future. And nowhere is this more apparent than in the Asia-Pacific region where there are more real and proposed systems than there are orbital slots to put them in.

This satellite boom is being largely driven by a rush to introduce increasingly affluent Asians to the joys of Pay TV, but the good news for business is that these systems will also become available for corporate communications. As Liz Fell points out in her comprehensive look at the topic (see 'The Great Asia-Pacific Space Crush' starting on page 69) this will inevitably lead to a much more competitive services market overturning the monopolistic ways of Intelsat. It will mean that, where permitted (and the regulatory situation here is confused to say the least), private operators such as PanAmSat will be able to provide connections from Australia/New Zealand to mainland Asia and the US west coast.

What makes this satellite boom even more intriguing is that it's largely being driven by private business interests, not state-owned telcos. The irony is that satellite technology, once the greatest bastion of the international telco cartels and their 200-300% mark-ups, may be the first vehicle for the introduction of truly competitive international services.

MASmeaton

In the May edition of *Australian Communications* . . .

THE ISDN ALTERNATIVE?

Are high-speed services like ISDN really under challenge by the latest generation of V.fast modems which promise transmission speeds of 28.8Kbps and even higher throughput rates? Next month we take a look at the capabilities of each.

CLIENT/SERVER SECURITY

Client/server computing is increasingly all the rage, but has enough consideration been given to the new network security risks it raises? In our next edition we take a look at network security issues and how they relate to client/server architecture.

THE ADSL REVOLUTION

Telcos all around the world are showing great interest in ADSL technology, and in Australia, Telecom has recently given the go-ahead for a pilot implementation. What is ADSL and how will it be used? Next month we take an in-depth look.

NETWORK MANAGEMENT

Corporations need assurance that their LANs can be trusted to handle the mission-critical data previously taken care of by mainframes. A new class of software platforms called management frameworks could be the insurance policy they need.

Advertising Enquiries:
Craig Burkill or Dawn Switzer
(02) 264 2200

AUSTRALIAN
communications

EDITOR
Mark Smeaton

CONTRIBUTORS
Tom Amos, Stewart Fist, Liz Fell,
Peter Leonard, Peter Waters,
Stuart Corner, Graeme Le Roux,
Bernard Levy,
Alan Lloyd, Peter Purton

ASSISTANT EDITOR
Sarah Parkes

PRODUCTION MANAGER
Elisabeth Alexander

ILLUSTRATIONS
Raphaella La Roche, Aldo Venturi
Loui Silvestro

SALES AND MARKETING DIRECTOR
Craig Burkill

DEPUTY ADVERTISING MANAGER
Dawn Switzer

CHIEF FINANCIAL OFFICER
Jennifer Stibbard

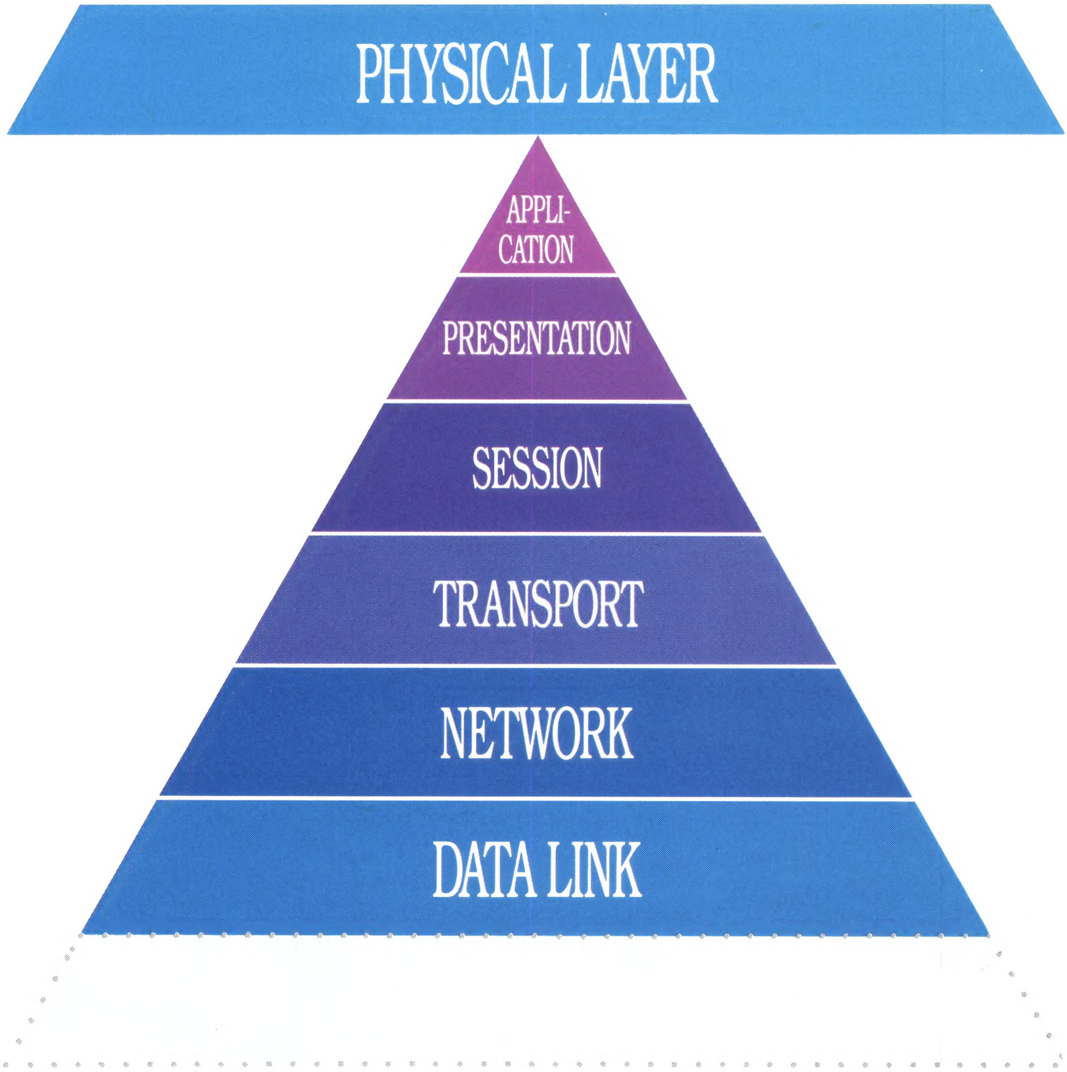
Subscriptions
Australian Communications is available by paid subscription for $54 per annum. Subscribers receive eleven issues per annum.

Overseas Rates by Air	1 Year	2 Years
New Zealand, Papua New Guinea	$66	$110
Singapore, Indonesia, Malaysia, Brunei, Pacific Islands	$72	$122
Asia — including Hong Kong, India, Korea, Japan, Taiwan	$78	$133
Europe, North America, Middle East, South America	$92	$168

Publishers
Published and distributed monthly by Ostasun Pty. Ltd. (ACN 003 606 102) under licence from ACP Computer Publications, a division of ACP Publishing Pty. Ltd. (ACN 053 273 546) of 54 Park Street, Sydney NSW 2000. ISSN 0818-9021. **Address:** Level 4, 541 Kent Street, Sydney NSW 2000. **Tel:** (02) 264 2200 **Fax:** (02) 264 2244.

Printed at **Offset Alpine Printing**, Derby & Wetherill Streets, Silverwater NSW 2141.

All material contained within *Australian Communications* is protected under the *Commonwealth Copyright Act 1968*. No material may be reproduced in part or whole without prior written consent from the copyright holders.
The opinions expressed in this magazine are not necessarily those of the publisher. We welcome feature articles from contributors. Manuscripts should be typewritten and all text, photographs and illustrations must be accompanied by a stamped, self-addressed envelope stamped to the appropriate value. Retain duplicates of both text and illustrative material; Ostasun (Pty. Ltd.) does not accept responsibility for damage to, or loss of material submitted for publication.
Articles reprinted in this issue from *Data Communications* (USA) are copyright 1994 by McGraw-Hill Inc. All rights reserved. Published from *Data Communications* with the permission of McGraw-Hill Inc., 1221 Avenue of the Americas, New York, New York. Reproduction in any manner, in any language, in whole or in part without the prior written permission of McGraw Hill Inc. is expressly prohibited. Articles reprinted in this issue from *Telecomeuropa* are copyright 1994 by News Bureau Publications. All rights reserved. Extracts published from *Telecomeuropa* with the permission of News Bureau Publications, 3 Princes Buildings, George St., Bath BA1 2ED, UK. Reproduction in any manner, in any language, in whole or in part without the prior written permission of News Bureau Publications is expressly prohibited.



Are you making physical layer decisions a top priority?

The wiring system, or physical layer, upon which your entire communications system is built may only constitute a small portion of your investment but can cause the vast majority of your network problems. How can you be sure, with technology and industry standards changing so rapidly, that your system can run the high speed applications your business demands? You can call Anixter. We have made the Physical Layer our business. We play a vital role in all the standards committees, but standards alone aren't the answer. You also need to sort out the wide array of available technologies. Only Anixter can help you do that. We provide solutions that meet your specific requirements. For Total System Performance, call Anixter.

ANIXTER®
Global Wiring Systems Specialists

SYDNEY: 61 2 333 0800 • MELBOURNE: 61 3 526 3617

ANIXTER AUSTRALIA PTY LTD: Unit 6, Waterloo Business Centre 44-48 O'Dea Avenue, Waterloo NSW 2017

©1993 ANIXTER BROS., INC.

FLEX

FLEX™. The Bridge to a new era in paging.

FLEX

FLEX is the bridge to a new era in paging technology which everyone is looking forward to. It offers more speed, more capacity and more features to transform paging into the communications tool of the future. FLEX will give the world smaller pagers (and longer battery life), pagers that communicate more voluminous data and pagers with better signal sensitivity. It will also provide greater opportunities for paging operators. FLEX, the new-generation paging system: another breakthrough by Motorola, the world leader in telecommunications technology.

MOTOROLA

TCP/IP Criticism Unjustified

I feel that I must respond to Alan Lloyd's article on TCP/IP naming and addressing published in the February 1994 edition [see 'Naming and Addressing — TCP/IP's Achilles Heel' starting on page 41] which I believe represents an inaccurate view of the TCP/IP protocol suite, and its capabilities to support a global networking infrastructure..

I am the Technical Director of Internode Systems Pty Ltd, a company which is involved with TCP/IP technology in many roles: we supply and support TCP/IP software; we provide TCP/IP-related consulting services involving connections to the global Internet; we provide TCP/IP training, and we develop software and hardware using SNMP technology to monitor and control a variety of devices. We are also involved in the field of real-time audio and video transport over TCP/IP networks, including the Internet.

- *'OSI is not slow'*

Alan asserts that 'OSI' is not slow, and cites the successes of 'OSI' endorsed technologies such as Ethernet as examples of technologies which exemplify this.

When people say 'OSI is slow,' they aren't referring to technology like Ethernet that has been labelled as 'part of OSI' after it has become popular. They are generally referring to one specific facet of OSI — the OSI network protocol suite. They are referring to the fact that current implementations of this protocol suite, in addition to suffering interoperability problems due to the plethora of incompatible options at every layer of the OSI protocol model, tend to be slow compared to TCP/IP due to a lack of operational experience, deployment, and testing. The OSI stack, in its full glory, requires so much implementation effort that existing products based on it are, to put it simply, *bloated* by the need to satisfy the demands of the protocol specification.

- *'ISO CLNP is better than IP because the addresses are longer'*

Alan contends that ISO CLNP (connectionless) network protocols' use of 20-byte address fields compared to IP's four byte addressing field adds 'almost no time' to a router's task of processing packets presented to it. It is hard to quantify 'almost no time,' but it should be clear that a fivefold increase in the size of the address field can lead to large performance problems, including increases in the CPU time and routing table memory required to deal with each packet handed in to the router for processing.

- *'X.400 is superior to SMTP (TCP/IP electronic mail)'*

Alan contends that X.400, with features for monitoring message transfer integrity, delivery reports and receipt notifications is superior to TCP/IP-based mail delivery systems employing technologies such as TCP/IP's SMTP (Simple Message Transfer Protocol).

The speed, reliability and sheer *extent* of SMTP mail systems today, plus the presence of gateways on the Internet from SMTP to almost every other e-mail system of significance on the planet, argue strongly in favour of SMTP as a viable electronic mail delivery mechanism for the global network.

SMTP is being deployed in the Internet to provide all of the above mentioned features of X.400 mail without sacrificing efficiency or interoperability with existing deployed mail systems to do it. These enhancements are being achieved via a backward-compatible extension to SMTP mail called MIME (Multipurpose Internet Mail Extensions) and another enhancement for secure cryptographically signed e-mail called PEM (Privacy Enhanced Mail) which are being propagated across the Internet as users move to upgraded versions of their mail user-agent programs. However, these upgraded systems are still able to interoperate with other systems that have not been enhanced. This upgrade leverages powerfully on the existing installed base of millions of interoperating Internet mail systems.

By contrast, Marshall Rose notes (in *The Internet Message*) that X.400 (1984) and X.400 (1988) don't even have a standard specification for how they should interoperate *with each other*, let alone with any other electronic mail environment.

Perhaps the major user-visible problem with X.400 is the sort of addresses that users are forced to use to describe themselves. A forest of tokens qualified with '/' and '=' signs, they don't fit on a business card, let alone in anyone's short term memory.

X.500, the OSI universal directory service, was the intended panacea for these addresses, which were to be relegated to something that the X.500 system quietly gave to your mail program to use with X.400. The world is still waiting. The largest operational X.500 directory system in the world is still a pilot, *running over TCP/IP* rather than OSI, as it has been for years.

- *'IP address limitations will ultimately strangle TCP/IP'*

Alan speaks of all of the IP users of the world registering for addresses and saturating the available addressing space by consuming all of the 'randomly allocated' unique addresses. Reality is not this simple.

The primary approach in the Internet to address this issue initially is a structured geographic allocation scheme called CIDR (Classless Inter-Domain Routing), designed to dramatically slow the consumption of Internet addresses. CIDR permits the aggregation of smaller 'classes' of IP network number ranges into larger units which can be dealt with by routers as a single entity in the global Internet. Under CIDR, organisations now receive a 'cluster' of Class-C network numbers (each of which can support 254 hosts). Recent advances in IP routing protocols support the advertisement of the entire cluster of addresses with a single 'routing update' entry sent between routers.

The effect on the consumption of IP network addresses globally is dramatic. There are 2,079,152 possible Class-C network numbers in the Internet address numbering scheme. Currently about 200,000 are allocated. There is plenty of room left for expansion, certainly long enough to address the issues of further extension of the addressing range of IP.

In addition, transitions of networks *inside* an organisation are not visible *outside* that organisation (actually this was already true prior to CIDR deployment, via a well established technique called IP-subnetting). The only transition visible in the Internet is the complete disconnection or reconnection of the entire corporate network — potentially thousands and thousands of nodes, but their transitional activities are completely invisible to the rest of the Internet. A single routing entry communicates the presence of the entire organisation to the Internet.

RIP is cited as an old routing protocol used with IP. It is the oldest dynamic routing protocol used with IP, and it is joined in the real world by a range of more powerful and faster protocols for dynamically communicating changes in the routing mesh.

One of many protocols being employed now over IP to great effect is OSPF (the Open Shortest Path First protocol). OSPF is highly efficient at the task of communicating changes in the landscape of the connections between networks. OSPF has a normal convergence time (time to update other routers when a change occurs) of under two seconds. OSPF uses an absolute minimum of bandwidth to communicate routing changes. It is highly optimised for this aim. It is a standard part of the product offerings of many major IP router vendors.

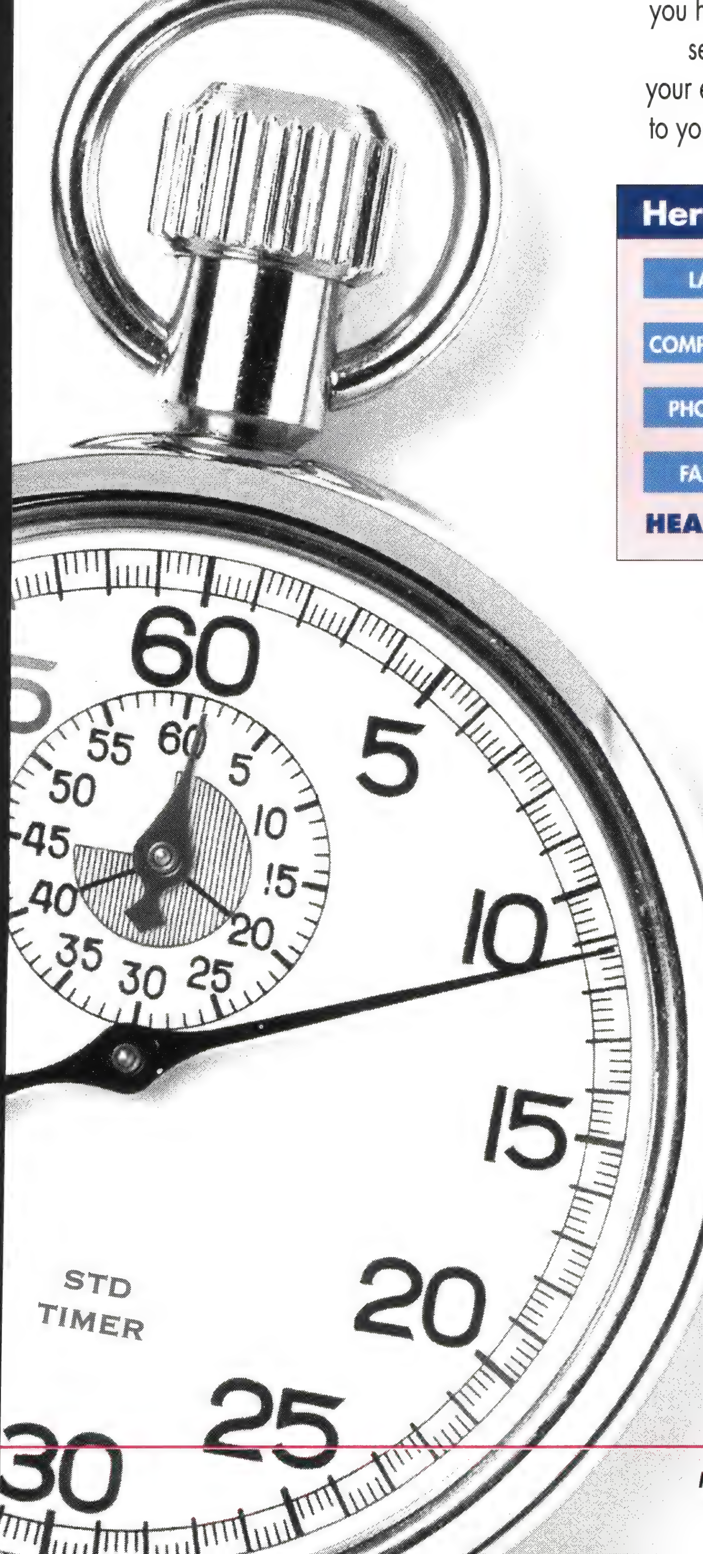
RIP continues to be used in IP networks, but generally as a *router discovery protocol* within local area networks. More advanced protocols, such as OSPF, maintain routing tables in the wide area context, and modern routers deliver a tiny summary of the 'state of the world' to the LAN using RIP.

So, to summarise:

- New addresses are no longer 'randomly' allocated. Addresses are allocated under the CIDR scheme at multiple levels. At the network provider/country level, each provider is allocated an appropriate slice of the 16 million Class-C network numbers. The provider then allocates groups of Class-C addresses in contiguous clusters to each organisation connected via that provider.
- At the provider/country level, the location of the entire collection of newly allocated networks administered by that provider is able to be communicated to the rest of the Internet by a *single* routing entry which uses a Class-C address and

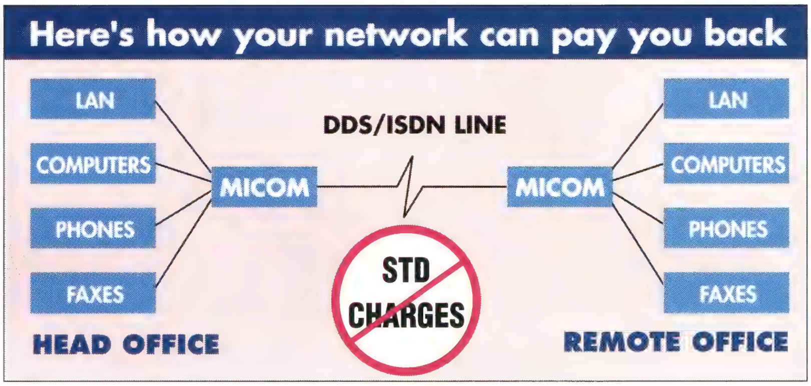
$4,287,026 saved to-date. $190 saved every minute.

Get your share!



Stop paying out hundreds, even thousands of dollars a month more than you have to on office STD charges. Our Micom data/voice/LAN network servers send free remote-office voice and fax with computer data over your existing DDS or ISDN line. So why pay for telephone calls and faxes to your interstate offices when you've already paid for a DDS/ISDN line?

Here's how your network can pay you back



With Micom on your DDS/ISDN line, the 45-minute conference call to your interstate sales office costs the same as the 12-page fax to your local warehouse – NOTHING. And, your computer data and Local Area Network traffic gets there safely, too.

Best of all, a business of any size can afford Micom. And, it will pay for itself in just a few months.

While you read this, Micom saved another $190. So get your share of the savings by calling Datacraft, toll-free **1800 803 448** for a free brochure on networking the Micom way.

MICOM®
Products that pay for themselves.™

DATACRAFT
Always creating better ways

DATA3449

MELBOURNE	SYDNEY	CANBERRA	BRISBANE	ADELAIDE	PERTH
690 5300	367 4444	239 6811	371 7655	410 0944	311 7111

Figure 1: A Numbered Based System

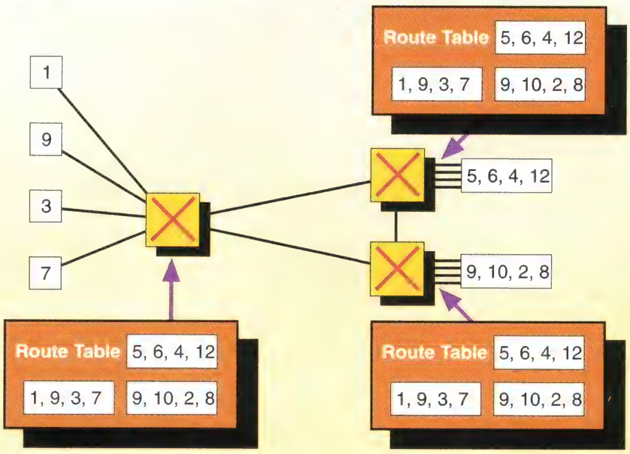
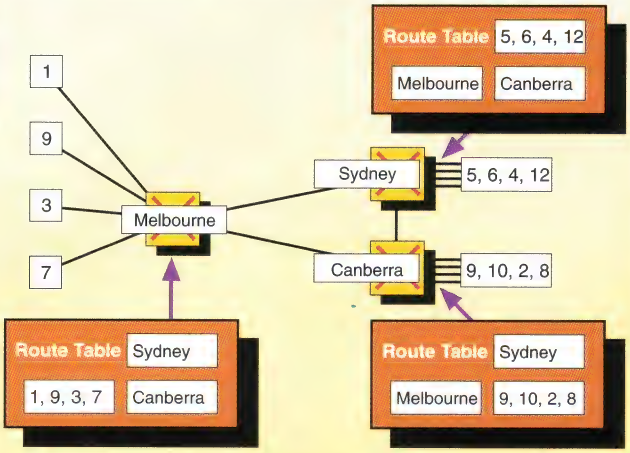


Figure 2: A Geographic Based System



Republished from Alan Lloyd's article `Naming and Addressing - TCP/IP's Achilles Heel' in the February 1994 edition

an appropriate 'network mask' value to express the presence of the entire hierarchy of networks in the providers' range.

- At the organisational level, a single routing entry is transmitted from the organisation to the provider, summarising all of their connected Class-C network number ranges with single address and mask.
- Existing, connected IP network numbers which do not fall under the above scheme continue to be advertised as individual entities in the Internet. The Internet core continues to handle them as it now does, but newly added networks fall into the CIDR allocations above, which produce orders of magnitude reduction in the growth rate of Internet routing traffic.

The longer term solution to running out of address space is the adoption of an extension of the current IP protocol suite to accommodate a larger range of network addresses. The Simple Internet Protocol (SIP) proposal mentioned by Alan has merged with another proposed scheme to become SIPP. The 8-byte addresses proposed in SIPP dramatically raises the number of potential host addresses to a value of the order of 10^{19} — orders of magnitude more than the population of the world.

Other approaches, including deploying CLNP 'below' IP are being actively trialled on the Internet, and the 'winner' will win on technical grounds, not on political or standards-based ones. Either of these schemes, or yet another, may become the endorsed evolution path for IP.

- *'IP Routing is not scalable'*

In the diagrams in Alan's article we need to assume that each box is an entire network, since if each box is a host, then IP already works according to Figure 2, and the point of Figure 1 is then difficult to see. In the diagrams and the associated text, the word 'node' is used to interchangeably refer to a single host and to an entire network. This is rather unfortunate, as it makes the resulting assertions incorrect but difficult to see as incorrect because of this confusion.

So let us define each term clearly for the purposes of discussion. A 'node' is a single addressable entity on an IP network. For instance, a single host computer or other device connected to the network. A 'network' in IP terms is a collection of nodes which are sharing a common range of numbers allocated to that group of nodes.

An IP 'router' generally deals with administering and locating those entire networks, *not* with caring about the presence or absence of individual hosts. The information exchanged between routers concerns changes in status of those entire networks, not of individual hosts.

So, the global consequences on routers and hosts of bringing up a single host computer on an IP network is . . . *nothing*. Nothing at all! No information needs to be propagated around the world as a result. A far cry from global meltdown at the flick of the power switch on some user's PC!

So with each box representing an entire network, IP is flexible enough to work according to *either* figure. Traditionally it has operated like Figure 1, holding a list of each connected network in the routing table of each core router. Note that no router inside an organisation ever carries a full Internet routing table. It carries routes for its own networks, plus a single entry called 'default' which points the way to the router that connects to the Internet.

CIDR allocation of new addresses changes the landscape so that it becomes a very good match to Figure 2, while retaining the flexibility to add exceptions to the geographical allocation scheme as and where required. It is a hybrid with the advantages of both.

- *'IP is simply not a sensible choice for a global network'*

Alan seems to feel that the fact that TCP/IP is, 'Easy to implement, is widely used, and is already a worldwide network' is a disadvantage! This is hard to appreciate. In each of these three aspects, the current state of global OSI networking is the precise opposite of each of these things.

The telephone network, the X.25 network, the ISDN network, and the X.400 messaging network are examples of technologies which *cannot* interoperate directly with each other. They are certainly global, but not globally integrated *with each other*.

Protocols such as TCP/IP can, and do, achieve that integration over practically any combination of underlying transports, on a global scale now. The carrier networks of the world are the *carriers* of the emerging global information web. Their role in this emergence is critical, but not all-encompassing.

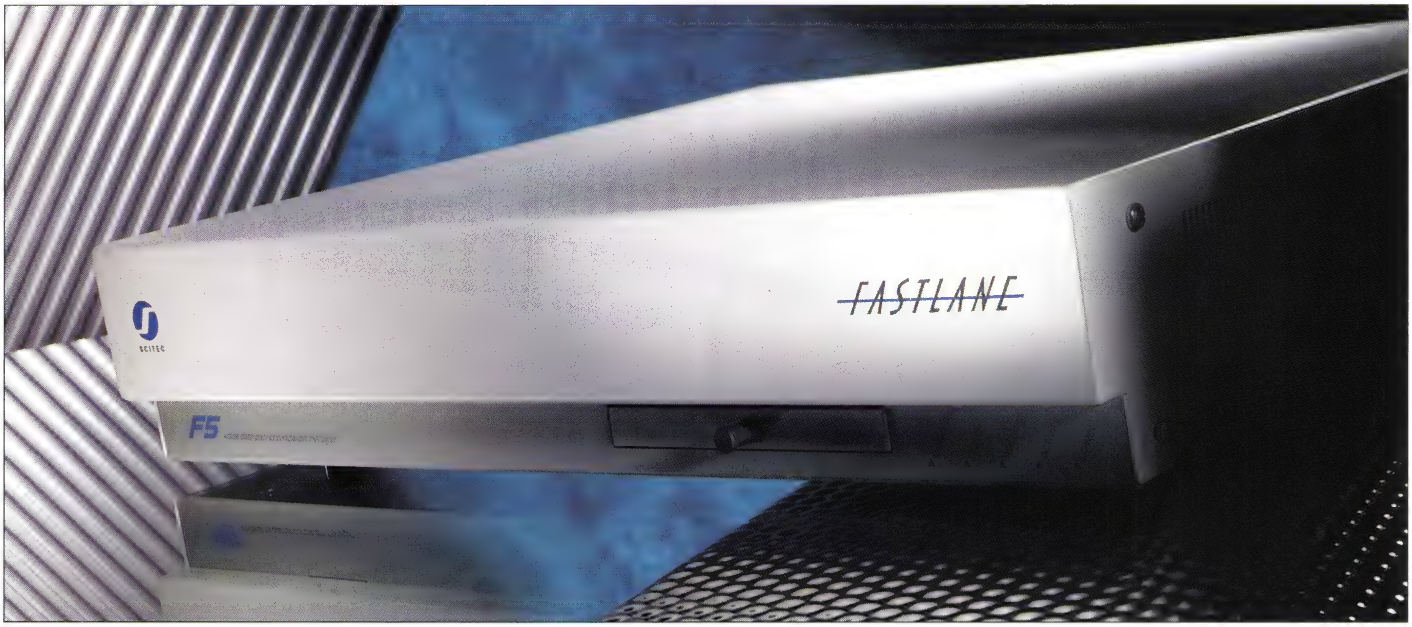
- *'IP has no security, no accounting, no resource measurement facilities'*

This is simply false. For example, effective security technology is being employed to achieve corporate Internet connections right now. Modern IP routers provide extensive, effective security and access control facilities, which companies and governments alike are using, along with high quality and secure host TCP/IP software, to engineer secure connections to the Internet. My own company has consulted to two State Governments to configure and audit secure Internet firewalls for them. These organisations have seen the demand for Internet connectivity, and have achieved their aims of a secure, useful connection to the Internet for their internal TCP/IP networks. They are using the Internet, now, to their advantage.

Accounting and resource management facilities are also available in modern IP routers, and are deployed to great effect by organisations that want to measure and quantify IP traffic flows.

In summary, the rumours of TCP/IP's imminent death are a little premature!

Simon Hackett,
Internode Systems Pty Ltd, Adelaide,
E-mail: simon@internode.com.au



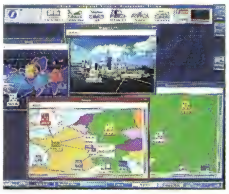
SNMP NOW MANAGES VOICE AND DATA NETWORKS

FastLane by SCITEC is a new low-cost, multi-function packet bandwidth manager that integrates data, LAN, Group 3 fax and voice on the one leased line, giving it the potential to completely eliminate STD charges and in most applications results in drastic savings that may well pay for the whole system within just one year.

FASTLANE

Unlike any other product in its class, FastLane has built-in SNMP agents to allow you to manage your local area network and wide area data/voice network from a central SNMP network management platform like SCITEC's InSight. Graphical management interfaces provide point and click pictorial displays of all network objects plus dynamic updates, alerts and statistical information to give you fingertip control of the whole integrated network on the one terminal.

With high speed RISC processors, Fast Packet Switching technology, high quality voice compression and operating at speeds from 9.6 kbit/s to 2 Mbit/s, FastLane can integrate everything from PABX and key systems to hosts, file servers, PCs, faxes, LAN bridges and routers on the same leased line. FastLane is a true networking product with support for existing and emerging network technologies such as Frame Relay and ISDN with a migration path to ATM makes FastLane truly the network managers platform of choice for cost-effective network solutions.



Call SCITEC today to take control of your network.

SCITEC

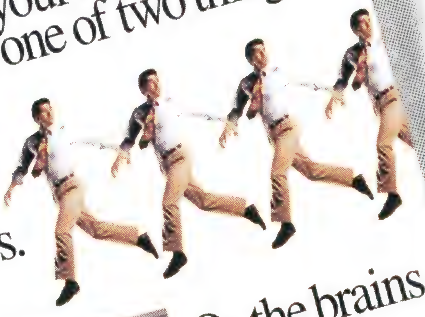
NETWORKS THAT PAY FOR THEMSELVES

SYDNEY	MELBOURNE	CANBERRA	ADELAIDE	BRISBANE	PERTH	UNITED KINGDOM
+61 2 428 9555	+61 3 690 8622	+61 6 285 1844	+61 8 362 4000	+61 7 371 9122	+61 9 324 1599	+44 753 833 222

SCITEC PRODUCTS ARE SOLD AND SUPPORTED IN 32 COUNTRIES AROUND THE WORLD

Hubs, Routers, Adapter
...... only 3C

To network your branch offices you need one of two things.



The resources.

Or the brains.

3Com's new hub also a hub, a hub a *hub*, and a **hub**

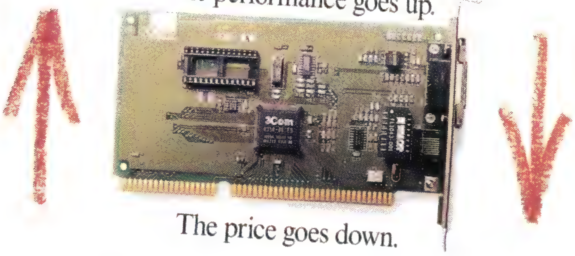
It used to be that a hub was a hub. But now there's a hub that will grow and change with your customers' networks. In more ways than ever.

Introducing the new LinkBuilder* Flexible Media Stack hub family. The most cost-effective alternative to chassis-based hubs, with th ity to meet the demands of your works now and years fr

Every hub in stackab

A lesson in economics:

The performance goes up.



The price goes down.

The best economics lesson these days can be learned right on your network.

Introducing EtherLink* III, a 16-bit adapter family so quick it boosts performance 25 percent over even the leading adapter today. At a price that is surprisingly low.

EtherLink III, with Parallel Tasking™ technology, is so advanced it configures itself automatically. One command is all you type. It comes with network management capabilities, and supports all major media types. And it's so unique it's even patent-pending.

Yet for all this, the EtherLink III family is so reliable that should one ever fail, 3Com will replace it free of charge.

To learn more about this remarkably fast adapter family and its surprisingly low price, call 3Com on **(02)959-3020, ext. 22.** Or see your nearest 3Com reseller. It's one economics lesson that really pays off.

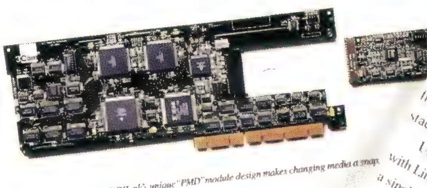
3Com

©1992 3Com Corp. (408) 764-5000. 3Com, EtherLink and Parallel Tasking are trademarks of 3Com Corp.

End of lesson.

Insert 20626 on Enquiry Card

Think of this as the match that lit the fuse that started the FDDI revolution.



FDDILink's unique "PMD" module design makes changing media a snap

Every revolution has its moment of truth. For FDDI, that moment is now.

Introducing 3Com's FDDILink™ family of 32-bit EISA adapters. They bring blistering FDDI performance to your network for as little as $2,500. That's up to half the cost of comparable adapters.

And that's not all. Backed by a lifetime warranty, the FDDILink family gives you the flexibility to ease your network into FDDI, at your own pace. Thanks to their unique "PMD" module design, FDDILink adapters can be used with shielded twisted-pair cable or fiber-optic cable. And even with unshielded twisted-pair when standards are finally approve Simply plug in the appropriate media module.

Now you can let the high-powered hardware an software on your network perform at its full potential.

That's because FDI performance to th twisted-pair co

And wh NETBuild you hav the de

th

Tech Pacific Australia
(02) 697 8666

BICC Communications New Zealand
(09) 358 0322

Tech Pacific New Zealand
(09) 415 8300

i.t. connXions Aus.
(02) 415 0555

©1993 3Com Corp. (408) 764-5000. 3Com, FDDILink, LinkBuilder, and NETBuilder are trademarks of 3Com Corp.

Who says you can't that is. Now there's grow and change with

LinkBuilder FMS st from 3Com. The most flexi stackable hub solution in the

Unlike standalone fixed-por with LinkBuilder FMS you can sta a single hub and grow into a stack tha just one logical repeater.

When you are ready for management instead of buying an entire managed box, you can just plug an SNMP management module into the back of any LinkBuilder FMS hub. This will automatically add

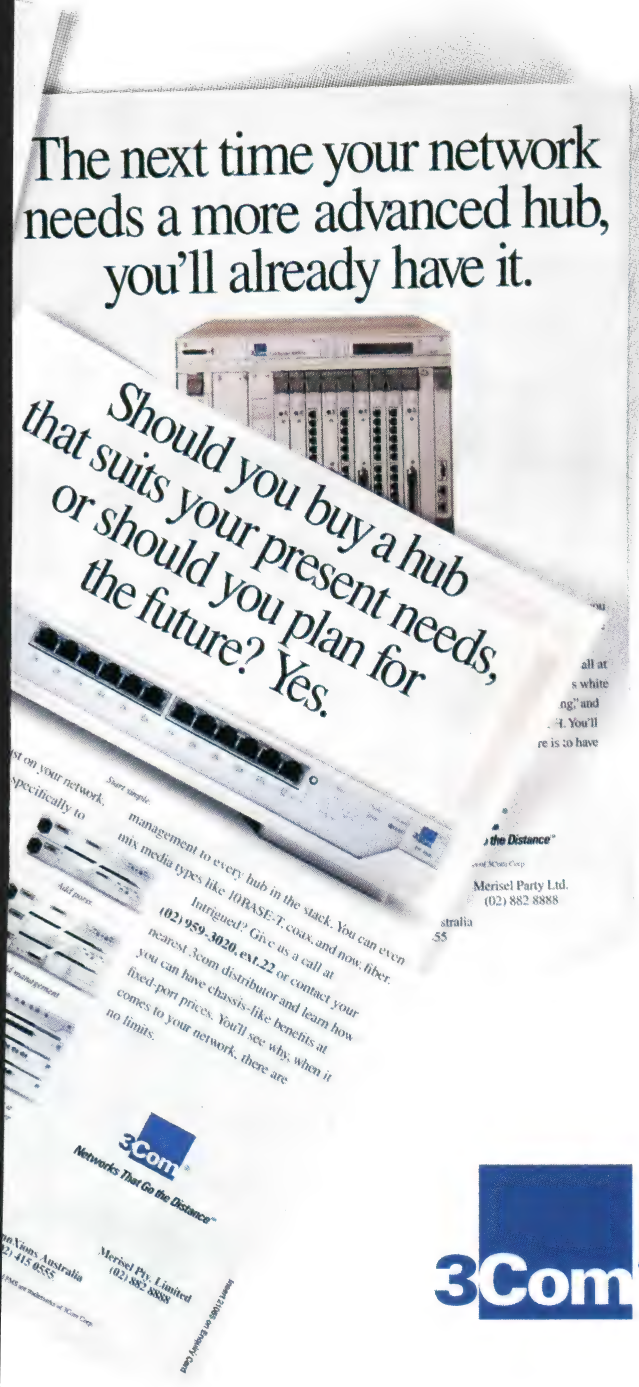
Tech Pacific Australia
(02) 697 8666

BICC Communications New Zealand
(09) 358 0322

Tech Pacific N
(09) 415 8

©1993 3Com Corp. (408) 764-5000. 3Com, Networks That Go the

, Network Management
m's got it all.



The next time your network needs a more advanced hub, you'll already have it.

Should you buy a hub that suits your present needs, or should you plan for the future? Yes.

management to every hub in the stack. You can even mix media types like 10BASE-T, coax, and now, fiber. Intrigued? Give us a call at **(02) 959-3020, ext.22** or contact your nearest 3Com distributor and learn how you can have chassis-like benefits at fixed-port prices. You'll see why, when it comes to your network, there are no limits.

3Com Networks That Go the Distance

Merisel Pty. Limited (02) 882 8888

Building a finely tuned network can be a challenging experience, especially if the core components are not perfectly matched. That's why hundreds of companies who rely on their computer system as a business critical resource have chosen 3Com as their preferred networking specialist. No other manufacturer offers such a comprehensive range of compatible networking products. And because data networking is all we do, we understand the total picture of security, migration, scalability and management better than anyone.

It is this understanding of networking issues which sees 3Com driving many of the data networking standards being implemented today. And it is this understanding that more and more organisations have come to rely on. From simple desktop connectivity to complete enterprise systems, only 3Com can provide the total solution.

3Com®

Title (Mr/Mrs/Ms/Miss/Dr/Other)..

Name ....

Position..

Company ....

Address..

....

State ....Post Code ....

Telephone ....Facsimile....................

Yes, I would like more information about 3Com.

☐ The 3Com Buyer's Guide
☐ Boundary routing paper
☐ Network management paper
☐ High perfomance scalable networking paper
☐ Please place me on your seminar invitation list
☐ Could someone call me?

Please fax to **(02) 956 6247** or mail to 3Com ANZA, Level 7, 99 Walker Street, North Sydney NSW 2060.

NEC Wins ADSL Pilot Contract

Pay TV and video on demand (VOD) moved a step closer last month with Telecom's decision to appoint NEC Australia as prime contractor to construct a pilot implementation of ADSL (Asymmetric Digital Subscriber Line) technology.

Starting early next year, the Melbourne-based trial will involve about 300 customers and cost around $17.5 million. NEC and its partners will receive $15 million of that amount with the remaining $2.5 million granted to Sydney-based Jtec to supply an experimental ATM-based multiplexer to interface with Telecom's fibre network, and a set-top ADSL interface for the home user. NEC's partners include Digital, which will provide a video server for the project; and AWA, which will supply one type of ADSL transceiver. The State Film Centre of Victoria will provide films and videos for the pilot.

Telecom's Managing Director, Network Products, Gerry Moriarty, said: "By implementing this pilot service we will be looking to define viewers' perceptions of the quality of ADSL-delivered Pay TV and VOD." The pilot will include both CAP (carrier amplitude phase) and DMT (discrete multitone) ADSL technologies in order to fully assess the suitability of each.

Moriarty also said that Telecom expected to have one million homes connected to its broadband network by the end of 1996. ADSL will be used to extend broadband services to those homes not in reach of a broadband connection, he said.

Is Telecom's Dominance Waning?

In a landmark ruling Austel has signalled that — under certain circumstances — Telecom need no longer be considered the dominant carrier in the mobile market. Without the dominant tag, Telecom will be free to discount tariffs as it wishes and compete with Optus in a much more focused manner.

In its recent review of its July 1993 direction to Telecom that it remained the dominant mobile carrier, Austel now says Telecom's adherence to certain safeguards would effectively place the carrier 'other than in a position to dominate the market.'

The safeguards, which Austel is now working to include in a compliance manual together with other requirements, are:

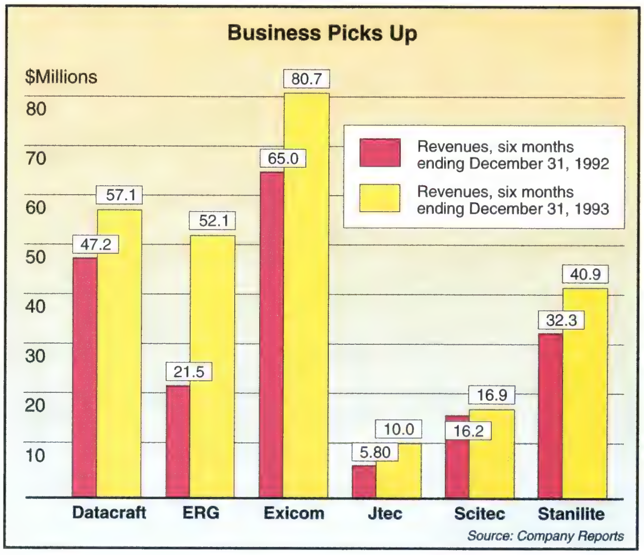
- That Optus and Telecom reach a new interconnect agreement on reasonable terms;
- That Telecom implements full accounting separation between its wholesale business of selling network capacity and its retail MobileNet business;
- That Optus be kept informed of AMPS network upgrades; and
- That Optus' service be unhindered and access to Optus customer information be quarantined from Telecom.

Telecom Moves Into Cable TV

Telecom has struck a deal with with new cable TV operator, Cable Television Services (CTS) to supply cable TV services to up to 1.1 million homes over the next three years. Telecom's new Visionstream subsidiary will lay the fibre/coax cable TV distribution network which will reach some Sydney and Melbourne suburbs as early as July.

Telecom will charge about $250 for connection to the network and a remote-control set-top box. Once connected, subscribers will pay CTS around $10 per week for the service, which will include two pay-per-view movie channels. CTS has the Australian rights to Turner Broadcasting's CNN news and MGM's movie library.

The service will shortly be rolled out to Canberra, Brisbane and the Gold Coast , with other cities to come online from 1995.



Source: Company Reports

Optus Posts $59 Million Loss

The latest half-yearly accounts of major Optus Communications shareholder, Mayne Nickless, have revealed that Optus recorded a loss of around $59 million for the six months up until December 31, 1993. Mayne Nickless has a 25% stake in the carrier and has booked a $14.8 million loss for the period on its $410 million Optus investment.

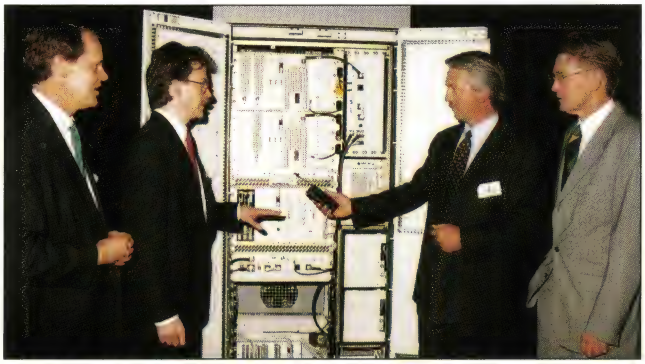
Mayne Nickless Managing Director, Bill Blytheway, said Optus was developing strongly, noting that its long distance services can now be accessed by 74% of the population. He added that the company is still on track to begin generating profits by 1995-96.

Telstra Lands $10M DG Hub

Telstra has won a contract worth $10 million over the next five years to provide telecommunications hubbing services for US computer vendor Data General. The deal follows Data General's decision to base its Asia-Pacific Field Data Centre in Sydney, and its selection of Australian software house McNamee Sutton & Partners to provide software to support the new Centre.

Managing Director of Data General Australia, Philip Kerrigan, said Telstra's wide regional presence was a key factor in the decision. Telstra Chairman, David Hoare, said the deal was won despite strong competition from Singapore and Hong Kong.

Graeme Barty, NorTel's Assistant Vice President, Carrier Networks Marketing (right), with Telecom's Group Managing Director, Network and Technology, Doug Campbell. NorTel last month signed its 5-year Strategic Partnership Agreement with Telecom under the carrier's Future Mode of Operation program.



From left: Nokia's Pertti Melamies and Eero Vallstrom, ERG CEO Peter Fogarty and WA Premier, Richard Court with the new base station

Nokia-ERG Alliance Flourishing

ERG, the booming Perth-based manufacturer of telecoms and ticketing equipment, had twin causes to celebrate in late February with the opening of its new manufacturing plant and the launch of a new tropicalised Nokia GSM base station.

The base station, known as the 'Tropical/Nordic GSM Outdoor BTS,' is the first new product to result from ERG's strategic alliance with Finland's Nokia Telecommunications. Designed by Nokia in conjunction with ERG, it can can operate in temperatures from -40°C to +55°C and withstand winds of up to 160km per hour. Less than one metre wide and two metres tall, ERG CEO Peter Fogarty says local content in the product is around 90%, and its main target export markets include Asia and the Middle East.

ERG's alliance with Nokia was sealed in 1992, although the companies had formed a relationship as early as 1990. Nokia has won contracts to supply Optus and BellSouth New Zealand with GSM base stations, and last year all deliveries to Optus were manufactured in Australia by ERG, says Pertti Melamies, Managing Director of Nokia Telecommunications Australia.

Located in the Perth suburb of Balcatta, ERG's new manufacturing plant was opened by Western Australia Premier Richard Court, a long-time ERG supporter who revealed that the WA Government had helped finance the purchase of the factory site in return for various investment and employment commitments.

That support has paid off and ERG's revenues have grown from $7 million in 1989/90 to $70 million in 1992/93, with sales this year tipped to top $100 million. Operating profit for the six months ending December 31, 1993 came in at $4.74 million. The company currently employs more than 450 staff in several world locations.

Optus Starts OSS Phase II

Optus recently launched Phase II of its much-touted Operational Support Systems (OSS) development plan by signing Participant Agreements with 11 IT vendors. The agreements bind the signatories to several core principles, including spending 85% of OSS development funds in Australia and maintaining an export focus.

Optus CEO, Bob Mansfield, said that over the next 18 months seven new projects would be initiated under the OSS Phase II umbrella. They will include a new order processing system, a corporate records database and access methodology, a universal call collection and call charging process and the development of a single integrated customer bill for business customers.

The OSS Phase II participants are: Applied Computing Devices, Computer Power, Dialog, Digital, Fujitsu, Logical Technologies, Oracle Systems, Pacific Star, Praxa, Unisys and Whitesmiths Australia.

In Brief

Ericsson Australia has awarded six research grants totalling $1.6 million to Australian universities to study mobile telephone reception problems. Two grants each have been awarded to the University of Technology, Sydney and the Victoria University of Technology, while the other beneficiaries are the University of Wollongong and the Australian National University.

Pacific Star Telecommunications, the Queensland-headquartered communications facilities management company, has recently landed two new contracts: Metway Bank, which has appointed the company as broker for its $3 million annual telecommunications billings; and Cadbury Schweppes, which has appointed Pacific Star facilities manager for its annual $5 million telecommunications requirements. The Cadbury Schweppes deal is Pacific Star's first major contract outside Queensland.

Krone Australia has opened a Tokyo office following the securing of a contract to supply Japan's NTT with MDF and other cable termination products. NTT will install the equipment in a chain of department stores and Krone is confident of further orders.

First State Computing has recently signed an agreement with BT Australasia to jointly pursue and develop integrated communications systems projects. First State Computing provides computing services to the NSW Government, while BT is responsible for the State's telecommunications network.

Telstra says ISDN customers now have a choice of terminating carriers in Japan following its recent agreement with Japanese carrier, International Telecom Japan (ITJ) to commence Switched Digital services. ITJ joins Telstra's existing Japanese correspondent — KDD — as one of 20 carriers with which it has ISDN links.

The Comcar Modernisation Project won a Gold Award at the Government Technology Productivity Awards held in Canberra in late February. In geographical terms, the project involves one of the largest mobile data systems in the world outside the Defence arena and covers the 300-vehicle Commonwealth Car Fleet.

Scitec Communication Systems has signed Cable & Wireless Ireland as a distributor for its FastLane bandwidth manager product range. The agreement covers the Republic of Ireland and includes engineering and support training. Scitec says further European FastLane distribution deals are imminent.

Saturn Global Network (SGN) has now opened an office in New York following the opening of its London office in January. Drew Kelton, SGN Director and General Manager for the Australian-based value-added network provider, says the opening is in line with the company's global expansion strategy.

Microcom, a US-based manufacturer of modems, has opened an Australian office. Based in Sydney, the office will support Microcom's distributors, including Sourceware, PC Plus and Merisel.

Microsoft will work to upgrade Telecom's Discovery on-line service after the signing of a Memorandum of Understanding between the companies following Bill Gates' Australian visit.

Novell will work with Victoria's Ballarat University to incorporate key components of its Certified Network Engineer (CNE) and Certified Network Administrator (CNA) courses into the University's Computer Science syllabus. The relationship is the first of its kind for the US LAN operating systems vendor in Australia.

Northern Telecom (New Zealand) has won a $NZ6.5 million contract to supply New Zealand carrier Clear Communications with Synchronous Digital Hierarchy (SDH) transmission equipment. The equipment will form the basis of a new transmission network around the North Island. It will be supplied by Northern Telecom's UK-based European Transmission Systems Division.

Banksia Technology has won an order to supply up to 1,800 of its PRO MX-5 modems to the Victorian Directorate of School Education. The Directorate will use the modems to communicate with participants in its Schools of the Future project.

MobileCom '94, a new trade show focusing on mobile communications will be held at Sydney's Darling Harbour in November this year. Tony Pool, Director of MobileCom '94 organisers, High Profile Exhibitions, says that the exposition will cover all aspects of mobile communications and be open to the public.

In Brief

Alcatel has announced the creation of a mobile communications division, which will be involved in a wide spectrum of activities, from cellular fixed networks, radio systems and GSM terminals to Digital European Cordless Telecommunications (DECT).

Ericsson has secured two important Scandinavian sales — the first, a contract with Tele Denmark for delivery of the ERMES European paging system, and the second, a contract with Norwegian Telecom to supply a DECT-based cordless phone system for a trial of a local Personal Communications Service.

NorTel has won a contract to supply its DMS-100 digital switching equipment to Hai Phong in northern Vietnam. The deal comes after the lifting of a 19-year US trade embargo with Vietnam.

Arianespace has been selected by Intelsat for the launch of the new Intelsat 803 and 804 satellites, which will provide international telecommunications for the Indian Ocean/Asia Pacific region and the Atlantic Ocean region, respectively. The launches are scheduled for late 1996 and early 1997.

MCI has formed a strategic alliance with Nextel Communications which involves MCI's acquisition of 17% of Nextel for an investment of $US1.3 billion. The alliance plans to begin operation of MCI Personal Communications Services later in 1994.

COLT, (City of London Telecommunications), hopes to be the first network operator in London to offer switched services. The firm recently signed a deal with BT enabling interconnection between COLT's fibre optic local loop and the BT PSTN.

Scientific Atlanta has won the contract to be the exclusive supplier of satellite earth terminals for the Iridium global communications system. Under the terms of the $US15 million contract, the company will provide 10 System Control Segment terminals for Iridium telemetry tracking and command centres.

Korea's selection process for its second mobile phone project continues, with US firm GTE currently favourite, and Britain's Vodaphone and Hong Kong's Hutchison Telecom trailing closely.

Banyan Systems, a leading vendor of high end enterprise network systems, has announced the purchase of Beyond Incorporated, a vendor of enterprise-wide electronic messaging software. The agreement provides for Banyan to acquire outstanding stock of Beyond for $US17.5 million, with the acquisition expected to be completed sometime during the first quarter of 1994.

Cellnet, one of Britain's two GSM cellular mobile operators, has signed a contract with Nokia Telecommunications for the supply of infrastructure equipment for expansion of the Cellnet network.

Sun Microsystems, announcing its second quarter results, reported revenues of $US1,131 million, which represents an 8% boost compared with the corresponding quarter in 1993. Australian performance was even stronger, with a revenue increase of 21% on the same period in 1993.

RAD Data Communications revealed that sales of its LAN/WAN connectivity products for the fiscal year 1993 increased by 30% to $US60 million. Officials from the Tel Aviv, Israel-based company said growth had been particularly strong in Eastern Europe, which experienced an average increase in revenues of 250%.

The EPPA (European Public Paging Association), has been formed in Geneva, with 49 organisations representing network operators, service providers and manufacturers signing up.

Madge Networks, US vendor of Token Ring products, announced its annual and fourth quarter results for the financial year ending 1993. The company's revenues rose by 84% for the year, to $US145.5 million, and by 61% for the quarter, to $US44.7 million.

NorTel has announced the signing of a contract worth $C80 million to provide a public wireless network for Personal Cordless Telephone Service (PCTS) in 25 cities throughout Canada.

Ericsson made two separate announcements of corporate milestones recently. The company said it installed a record 11.7 million AXE lines in 1993 — 8.7 million local lines, and 3 million trunk lines. The second landmark for the firm was the commercial implementation of the 25th system based on the North American TDMA digital cellular standard.

Bell Mega-Deal Gets Cut Off

The proposed mega-merger between Bell Atlantic and US cable TV giant Tele-Communications has been abandoned after months of fruitless negotiations.

The $US23 billion deal, originally announced in October 1993, would have been the world's biggest ever corporate merger, and would have created US's sixth largest corporation.

Since announcing the deal, the partners have repeatedly missed deadlines set for the drawing up of a concrete agreement. Speculation during recent weeks that the deal was in danger of foundering resulted in Bell Atlantic's share price recently taking a dive from $US67 to $US53.

Industry analysts have suggested that the reasons for the breakdown can be found in the disparate corporate styles and cultures of the two companies, as well as the immense difficulties in blending the stocks of the two partners — one a sluggish, 'safe' utility stock, the other one of Wall Street's most aggressive growth stocks.

Alcatel Wins Asian SDH Contract

Alcatel has secured its first contract to supply a long distance Synchronous Digital Hierarchy (SDH) network in the Asia-Pacific region. Awarded by Indonesian telephone operator PT Telkom, the contract, estimated to be worth around ECU58 million ($A92 million), provides for the construction of a network of land and undersea optical fibre cable which will run the entire length of Java and interconnect to Denpasar in Bali.

To be known as the Northern Route, the 1,500km cable will provide a 2.5Gbps STM-16 link able to support around 32,000 telephone channels.

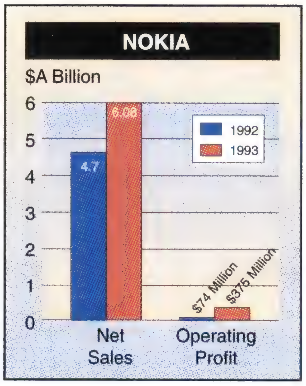
The equipment for the network will be supplied by Alcatel's French subsidiary Alcatel CIT and Alcatel Cable Contracting, and will include Alcatel 1664-SL synchronous terminals, Alcatel 1664 SX synchronous cross-connects, and Alcatel 1641 and 1651 SM synchronous add/drop multiplexers together with an Alcatel 1353 NX network management system. (Telecom*europa*)

Nokia Prepares to List on NYSE

Finland-based telecommunications manufacturer Nokia has reported strong growth for the 1993 financial year ending 31 December, with a boost in sales of 21%, and operating profit up 508%. The favourable results have prompted the company to begin preparations to list its preferred shares on the New York Stock Exchange, making it the first Finnish company to trade its securities on the NYSE.

Nokia's President and CEO, Mr Jorma Ollila, said the firm's Telecommunications and Mobile Phones divisions delivered the strongest performance. Nokia Telecommunications' net sales increased by 43% to FIM4.6 billion ($A1.18 billion), while operating profit was FIM983 million ($A252 million). The Mobile Phones division reported net sales of FIM6.3 billion ($A1.62 billion), an increase of 73%.

Nokia spent over FIM1.4 billion ($A360 million) on research and development in 1993, most of it in the Telecoms and Mobile Phones divisions.



Who’d have thought?

DG01801-1E

Clickn

Digital's intelligent hub: The DEChub 900

John Bevins DG01201-2L

ology.

Who'd have thought that the best way to unstack a stack would be to turn the stack on its side?

So you don't have to unstack it at all. Instead, simply click components in and out, without disruption to the network.

Digital's unique clicknology gives you easier installation, management and maintenance of networks – small, large or huge. And easier expansion.

Did you know that Digital offers a full range of local and wide area networking components and allows you migraine-free migration to all the rapidly evolving technologies, established and emerging? Ethernet, token ring, FDDI and ATM – all running at once, if you like.

To discover for yourself the benefits of clicknology with Digital's family of intelligent hubs, turn the page.

John Bevins DG01201-3R

Convert complexity to control:

"I know my network will change over time. What I don't know is how or when."

As the number of users increases, buy a hub and plug your modules in, quickly and easily.

When it comes time to add in more users, simply click in more DEChub modules and hubs.

Use Digital DEChub 90 and 900 modules stand-alone to minimise start-up costs.

Digital's DEChub 900 modules (using SNMP) can be managed stand-alone or in the hub. Another unique advantage of the DEChub family.

Digital's DEChub 90 and 900 series of intelligent hubs and modules allows you to keep your network options open. This enables fast and easy migration from individual stand-alone modules which can then be installed in a high-end switching hub as your network grows.

This unique flexibility is further reinforced by the unmatched choice of modules and technologies.

This choice covers bridges, copper and fibre repeaters, communication servers, routers and bridging routers, and FDDI concentrators and bridges.

You can take an existing DEChub 90 module and install it in a larger DEChub 900.

As the network density increases, you can use the DEChub 90 and 900 modules to boost the capacity to connect more users.

Call Digital on 008 021 393 for a free information kit with a 3.5 inch DOS demo disk of Digital's network management software, HUBwatch.

Who'd have thought?

digital®

® The "digital" logo, DEChub 90 and DEChub 900 and HUBwatch are registered trademarks of Digital Equipment Corporation.

John Bevins DG01201-8L

Will the Walls Tumble Down?

What impact will the completion of the Uruguay Round of GATT negotiations have on Australia's industry development schemes?

Australia's efforts to nurture and support its local telecommunications industry through off-sets schemes involving transnational manufacturers and vendors will become increasingly hard to justify as a result of the latest chapter in the GATT negotiations, the Uruguay Round.

In the direct line of fire are initiatives such as the Industry Development Arrangements (IDAs), the Partnership for Development Program (PDP), Fixed Term Arrangements (FTAs) and the Computer Bounty which are regarded by some as protectionist. But the successful completion of the Uruguay Round does not mean that Australia's local telecommunications companies will suddenly be left in the lurch. In fact, the opposite is true.

For a start, Australia will not become a signatory to Uruguay until GATT members meet in Marakesh, Morocco, this month. It is also considered extremely unlikely that other GATT nations will lodge trade barrier complaints against Australia, largely because the various off-sets schemes are considered innocuous and are destined to fade into history over the next few years.

Further, any complaints by GATT members against perceived Australian trade barriers would have to be arbitrated through a World Trade Organisation, which has yet to be established by GATT. In the meantime, Australia's off-sets schemes will be reviewed and phased out if and when they are found to be inconsistent with GATT.

A Department of Foreign Affairs and Trade (DFAT) analysis of the impact of the Uruguay Round on the local economy (titled *Outcomes for Australia*) notes: 'Australia's microeconomic reform program in telecommunications, which has resulted in a significant increase in the sector's international competitiveness, provides the basis for participation in market growth in the Asian region worth more than $110 billion over the next 20 years. The GATS (General Agreement on Trade in Services) will complement and underpin our domestic restructuring by improving the trading environment for telecommunications services, enabling Australian service providers to compete for business on the basis of clear rules and principles.'

The Fall-Out

Fall-out from the Uruguay Round on Australia's telecommunications industry can be viewed in two separate, but closely related, contexts. The first concerns the economic vision of politicians over the past decade. The second relates to the machinery of government, the bureaucrats at DFAT, the Department of Industry, Technology and Regional Development (DITARD) and the Department of Communications and the Arts (DOCAA), who administer the industry support programs.

Canberra observers suggest that DFAT has won the day and can rest comfortably in the knowledge that Uruguay will bring the curtain down on industry support schemes and that the Australian Government will do nothing to block GATT's progress. But at the same time, the department does not wish to be seen to be dictating policy to either DITARD or DOCAA.

In the words of a parliamentary researcher who asked not to be named: "DFAT does not want to have a stand-up fight with DITARD or DOCAA, which will now be forced to re-examine the off-sets schemes. DFAT staff don't feel they need to be gratuitous in public because there is no way the Government will back away from GATT." The source noted that DFAT's analysis of the Uruguay Round devotes less than half a page to Trade-Related Investment Measures (TRIMS) which cover such schemes as the IDAs and the PDPs.

The section states: 'The TRIMS decision clarifies existing GATT rules preventing governments from 'requiring' firms to meet specific performance targets. Requirements to purchase a minimum amount from domestic sources and so-called trade balancing requirements, which make access to imports (for example, at lower tariff rates) dependent on export performance, are among the sort of measures which are specifically banned by this decision.'

Director of Telecommunications and Broadcasting at DITARD, Raph Ciccini, said that while the Uruguay Round would necessitate a re-examination of the IDAs, the PDP and the other off-sets plans to ensure they were GATT-consistent, he did not see the IDAs as being a major issue because the scheme was a transitional measure. Ciccini said he believed the PDP and FTAs were not against the spirit of GATT because they were voluntary and also involved a large proportion of Government procurement, which was specifically exempted under GATT. But the IDA barriers on cheap imported cellular mobile telephones appear particularly vulnerable given that the vast majority of handsets are sold outside the Australian Government market.

Most of the companies involved in the PDP, such as IBM, Alcatel, Fujitsu, Ericsson and others, will emerge from their partnership arrangements in the next three to four years. Others, like Panasonic and Siemens, will not graduate until the year 2000.

In essence, the Uruguay Round means that Australia's telecommunications industry must now live up to the axiom of world best standards and practices; in effect, sink or swim. It's not insignificant that the Australian politician who led the country's contribution to Uruguay, former Trade Minister Senator Peter Cook, is now the Minister for Industry, Technology and Regional Development, taking over from the strategically-minded Senator John Button and the politically less fortunate Alan Griffiths.

According Don Mackay, an adviser to Senator Cook: "Times have changed. A lot of restructuring has been put in place and there's a lot more to be done. The things we required 10 years ago are different to what we require now. Senator Cook is looking futuristically at the global context. His position remains that we must be internationally competitive and that can only be good for exports and domestic industries generally."

Mackay said there was no conflict between former Senator Button's efforts to nurture the telecommunications industry while simultaneously, Senator Cook was working through the GATT forum to bring down protectionist trade barriers. "Senator Button was also breaking down barriers, for example, with the steel plan and the car plan. He did the hard work and we've now got to refine it and push industries like telecommunications to be the best in the world." Mackay said.

Senator Cook's strategies will be revealed in his Industry Statement in early May, prior to The Budget on May 10.

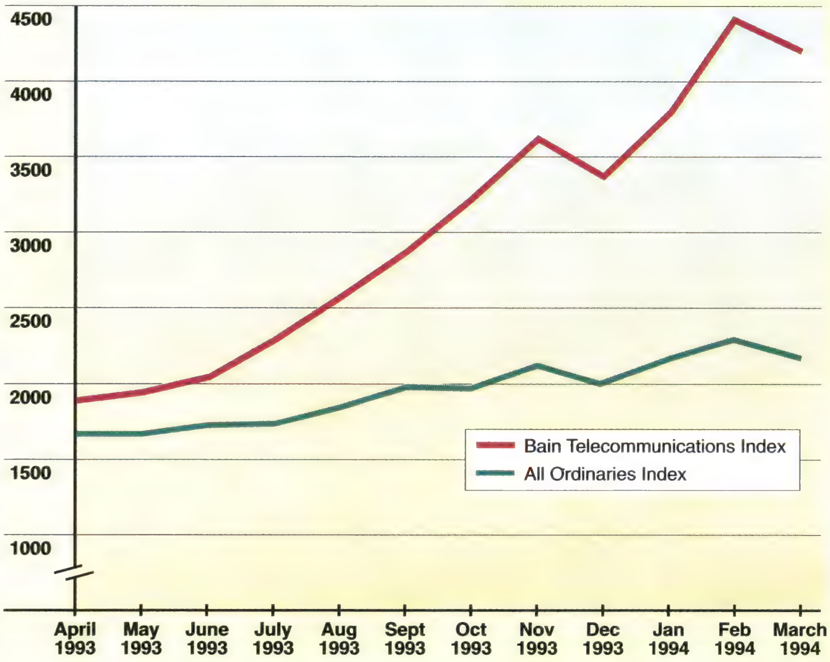
Do They Work?

The success or otherwise of Australia's offsets programs can be measured from figures compiled by Austel, which issues IDA licences and audits the scheme on a points basis, and DITARD, which administers the PDP, the Vendor Qualification Scheme, Fixed Term Arrangements and the Computer Bounty scheme.

Established in 1989 and extended last year until June 30, 1996, the IDAs, which cover customer premises equipment including first telephones, PABXs, small business systems and mobile phones, generated $451 million in turnover in 1992/93 — the fourth year of the scheme — compared with $385 million the previous year, according to Austel. Imports of CPE were $230 million, $12 million less than the first year, but $59 million more than the second year and $48 million more than the third year. Exports of $81 million in 1992/93 were $18 million higher than in the previous year and $46 million above the figure for the first year.

Local content in exports averaged 40.3% in 1992/93 compared with 39.7% the previous year and 33.5% in the second year. However, the 1992/93 figure represents a decrease compared with the first year's result of 45.6%.

Stock Watch



The Bain Telecommunications Index (BTI) includes only those public companies which derive the majority of their earnings from the telecommunications sector. It is calculated in the same fashion as the All Ordinaries Index and is maintained by the Australian Stock Exchange Index Office. The formula is:

$$\text{Today's Closing BTI} = \text{Yesterday's Closing BTI} \times \frac{\text{End of Day AMV}}{\text{Start of Day AMV}}$$

where AMV refers to Aggregate Market Value - i.e. total market capitalisation. The start of day AMV is the previous day's end of day AMV and is adjusted for any changes in the BTI such as additions, capital reconstructions, rights issues etc. This ensures that any movements in the BTI are the result of trading activity in that day only.

Company	Market Capitalisation $M	Performance %	Share Price ($) 1/3/94	Share Price ($) 52 Week High	Share Price ($) 52 Week Low
AWA	181.3	23.6	0.89	0.93	0.59
Datacraft*	103.0	708.3	0.97	1.00	0.10
ERG Australia	428.0	195.0	3.30	3.70	1.02
Exicom	116.0	123.5	1.14	1.40	0.41
JNA Telecommunications	83.2	75.0	2.80	3.40	1.40
Matrix Telecommunications*	135.5	490.1	2.80	3.65	0.52
NetComm	11.6	N/A	1.20	1.40	1.10
Scitec*	24.3	650.0	0.30	0.34	0.04
Stanilite Pacific	173.2	89.1	5.90	6.70	2.49
Techniche	85.3	292.9	4.40	5.25	0.82

**Not currently in the All Ordinaries Index*

Market capitalisation is the share price multiplied by total ordinary shares on issue.
Performance is the percentage share price movement over the past 12 months.

Source: Bain & Company

Companies involved in the PDP spent $300 million on research and development in the 1993 year, compared with $50 million in 1988. Exports by PDP companies totalled $1.2 billion last year, compared with $120 million in 1988.

Senior Project Officer at DITARD's Information Technology and Infrastructure division, Gary James, said the Computer Bounty scheme had proved so popular that their lobbying efforts had succeeded in having it extended until December 1995. Under the scheme, computer manufacturers can claim up to 10% of the direct costs of production, including labour but not including raw materials, from the Australian Customs Service. The rate drops to 8% on July 1.

Bernard Levy

Global Networking

Telcos Turning to TINA For Advice

At the time of going to press more than 30 telecommunications carriers, equipment suppliers and research organisations were expected to shortly announce their participation in the Telecommunications Information Networking Architecture Consortium (TINA-C). The organisations in question, including Telstra, agreed to formalise their participation at TINA-C's third Technical Committee meeting in New Jersey in January, and that process is now in train.

Yes, the industry has spawned yet another cryptic acronym, but what does it mean? And what is its significance?

TINA had its origins in 1990 when major network operators hosted the first TINA workshop as an open forum for discussing information and networking problems with telecommunications and computing vendors from the R&D community. The workshop proved successful and two more were held, the third in September 1993. During the course of these it was recognised that many small groups around the world were working on similar issues, and that the work could be carried out more efficiently and cost effectively by pooling resources. This prompted three major industry players — Bellcore, BT and NTT — to initiate a more formal organisation for the promotion of TINA (the TINA Consortium) in early 1992.

Formal announcement of the organisation, and invitation to participate was made at a conference in Japan in October 1992. Its objectives are:

1. To define a telecommunications networking architecture based on advanced distributed processing and service delivery technologies that will enable efficient introduction, delivery and management of telecommunications networks;

2. To validate the effectiveness of the architecture through laboratory experiments and field trials; and

3. To promote the use of TINA worldwide.

The initial timetable for TINA-C envisaged its formation early in 1993, and production of initial architecture specifications before the end of 1994. Much of the technical work is being carried out by a team of core researchers, on secondment to Tina-C from members and located in New Jersey. From the three founding organisations, the number of participants has grown to over 30.

However, the standardised provision and management of sophisticated telecommunications networks is already the focus of much attention. The ITU-T and ETSI are both active. This work is being undertaken on two fronts: Intelligent Network (IN) architectures and Telecommunications Management Network (TMN) architectures.

The IN concept is now well established and has already spawned many new services: virtual private networks, wide area centrex and the much larger scale global virtual private network services which are at the core of attempts by companies such as AT&T, BT and their partners to dominate the global corporate communications market. For smaller customers, INs offer services like Easycall call diversion, advanced freephone services and more.

Work on IN standardisation revolves around a definitional structure based on customer services. TNM, on the other hand is defined around management services, such as 'routing and digit analysis administration,' 'traffic management' and 'traffic path management.'

One of the main aims of the TINA initiative is to bring about a convergence of work on IN architectures and TNM architectures. There is also a need to evolve TINA in line with developments in distributed and object oriented computing technology. In a draft statement prepared to announce formalisation of TINA-C, the organisation states:

'There is a recognised need to take advantage of distributed computing and object oriented design to help solve the problems (of network management) and a further recognition that IN and TNM cannot be treated separately, but must be integrated together with distributed computing and object technology. These latter points are currently not completely addressed by either IN or TNM.'

[Acknowledgment is made to two articles from the March 1993 edition of the *IEEE Communications Magazine*: 'The TINA Initiative' by William J Barr, Trevor Boyd and Yuji Inoue, and: 'TNM + IN = TINA' by Menso Appledorn, Roberto Kung and Roberto Saracco.]

Stuart Corner is the Editor of Exchange.

"Most Australian telecommunications companies believe exports will fuel their revenue growth in 1993-4 year ... particularly in South East Asia and China."
EXCHANGE NEWSLETTER 2/7/93

Don't miss out on these opportunities. Get the latest news on these crucial markets from Telenews Asia, the region's only fortnightly dedicated to telecommunications.

There's no advertising. Just concise, objective and independent information, supplied by our Asia-wide network of correspondents and edited for specialists by specialists.

GET THE NEXT 3 ISSUES FREE

Judge Telenews Asia for yourself. Just mail or fax this form for your 3 free issues.

Please send me the next 3 Telenews issues at no charge and without any obligation.

Name ______________________

Company ______________________

Address ______________________

MAIL TO: STUART CORNER INFORMATION SERVICES
PO BOX 13 ROZELLE, NSW 2039 AUSTRALIA
FAX: (02) 818 2294 INTL: + 61 2 818 2294
PHONE: (02) 555 7377 INTL: + 61 2 555 7377

TELENEWS Asia

United States

Major US Telecom Changes Mooted

All the recent talk in the US about its proposed National Information Infrastructure (NII) and other communications reforms may sound like just so much political posturing to seasoned observers — but this time it's different. Not since the breakup of the Bell System 10 years ago have pending legislation and US Government initiatives held the potential for such sweeping changes to how US corporations — and individuals — communicate.

There are currently three bills before Congress that, if passed, will allow telcos, cable operators, and competitive access providers to compete in the local loop. At the same time, they will ease restrictions on the Regional Bell Operating Companies that now keep them both from delivering some forms of inter-exchange service and from manufacturing telecom equipment.

The bills before Congress also must be squared with proposals for change from the Clinton administration. The broad outlines of the administration's NII initiative are being delineated in terms that are largely consistent with the pending legislation. Intent on placing the administration's stamp on the legislation, Vice President Al Gore has proposed a new, all-encompassing regulatory framework.

Easing up on the RBOCs?

The RBOCs have long chafed under restrictions that made foreign and niche markets their best investment opportunities. Unable to find many champions in the past, they've recently been able to persuade key members of congress that the remaining major restrictions established in the Modification of Final Judgment (MFJ) and administered by Judge Harold Greene are unwarranted.

They've also acted to break down barriers to enter into new markets. In addition to Bell Atlantic and its (eventually abortive) merger with Telecommunications Inc., US West and other RBOCs have announced intentions to join forces with cable operators to provide video programming and other services across the US. What's more, Bell Atlantic mounted a successful challenge in Federal Court overturning the restrictions that had kept it from supplying programming. Last August, Judge Ellis of the US District Court issued an order declaring the prohibition unconstitutional, citing Bell Atlantic's right to furnish video programming as a form of free speech protected by the First Amendment. Although the Justice Department has asked the US Court of Appeals to reverse this decision, most other RBOCs have since filed similar complaints.

Announced late last year, the NII (see 'Does Australia Need a National Information Policy?' in the December 1993 edition) calls chiefly for private investment, although plans have been made to continue the High Performance Computing and Communications Program, which funds the Internet backbone and research initiatives. At a speech given at the US National Press Club in December, Gore indicated the administration supports the elimination, "over time, under appropriate conditions, of all judicial and legislative restrictions on all types of telecommunications companies: cable, telephone, utilities, television, and satellite." The goal, he said, is to lay the groundwork for an open market for information.

Gore outlined five underlying principles: the NII should be built by the private sector; it should promote and protect competition; it should promote open access to the market; it should avoid creating a society of information 'haves and have-nots;' and it should make sure that new laws and regulations can readily accommodate rapid changes in technology.

Gore also commented favourably on a report from the Council on Competitiveness, a US industry consortium involved with NII, that calls for networks to be interconnected and to interoperate. The council also suggested that barriers keeping local telcos from entering the cable and long-distance markets be removed; that prices reflect competitive market conditions; that safeguards against cross-subsidisation be adopted; and that universal service be enhanced and expanded and its costs shared by all service providers.

The administration approves some aspects of the three bills now before Congress. It has specifically said that it supports what is known as the Brooks-Dingell bill, officially H.R. 3626. This legislation looks to supersede MFJ, establishing timetables and criteria that, when satisfied, will allow the RBOCs to provide inter-LATA (Local Access Transport Area) service and engage in manufacturing. Under the bill, the RBOCs would have to apply to and obtain approval from both the Justice Department and the FCC in order to provide an inter-LATA service. In essence, the bill would allow the RBOCs (1) to apply to the Justice Department and the FCC to provide 'Interexchange telecommunications through the acquisition and resale of telecommunications services' 18 months after the bill's enactment and (2) to request permission to furnish all types of interstate telecommunications service 5 years after enactment, except as may be authorised sooner for discrete interexchange services.

If the bill goes through as written, the RBOCs will be able to apply immediately for three subsets of interexchange service. First off, they can request any long distance services for which 'no actual or potential competition' exists. Second, they can ask to be involved in interexchange telecommunications that are incidental to other services they already provide (presumably, these would be cable, cellular, and, possibly, gateways associated with RBOC information offerings). Third, they can seek to supply interstate interexchange telecommunications that originate and terminate in their own service areas or in regions serviced by an affiliate as of November 21, 1993.

The FCC is charged with formulating regulations that prevent cross-subsidisation of manufacturing and regulated services revenue. It also must ensure that RBOCs disclose their technical requirements to other equipment manufacturers.

Looking at the Local Loop

The two other bills (H.R. 3636 and S. 1086) address the nation's telecommunications infrastructure and the relationship between telcos and cable providers.

Perhaps the most significant aspect of these bills is that they provide for facilities-based competition for local exchange services, even pre-empting state regulation. The two pieces of legislation are very close when it comes to interconnection and competition on the local loop. Both also give the FCC express authority to oversee pricing of telecom services that have become or are 'reasonably expected to become' subject to competition. S. 1086 also gives the FCC the discretion to allow carriers that do not dominate a market from having to file tariffs.

Both bills also seek to enhance and promote universal service. H.R. 3636 directs the FCC to initiate an inquiry into a so-called open platform service that would be available to all subscribers at reasonable rates. This offering is defined as a 'switched, end-to-end common carrier digital service which provides access to multimedia information services, is widely available and is based on widely accepted standards, and is available to all customers on a single-line basis.'

Both bills allow the local exchange carriers to deliver video programming through separate subsidiaries to subscribers in their service areas. But the local carrier is not allowed to acquire unaffiliated cable systems in its service area. This restriction addresses the constitutional issue presented to Judge Ellis in the action instituted by Bell Atlantic because it mandates a de facto duopoly — cable and telco — in every subscriber area. It can be viewed as a reasonable government initiative intended to prevent telcos charging excessive rates for video programming service while at the same time allowing the LECs to exercise their rights under the First Amendment.

In addition, H.R. 3636 requires the telcos to establish a video platform to be used to provide programming and to ensure access to other programmers.

Douglas Jarrett

HASSLE FREE

Bergsøe ③ International

TOKEN-RING PCMCIA AND POCKET ADAPTERS

If you've been hearing about installation hassles when it comes to portable Token-Ring adapters, then it's time you heard about Olicom. Thanks to our superb installation support, our PCMCIA and Pocket Adapters are about as near to plug-and-play as you can get.

They're packed with power, too. In fact, coupled with our high-performance PowerMAC drivers, they're about the fastest portable adapters around. And if you don't have an Olicom adapter in your PC back at work, you might just discover that the computer on your lap works faster than the one on your desk!

Like all Olicom products, our portable adapters are 100% IBM compatible and interoperable, and support all major network operating systems.

In short, if you're wondering how they crammed so many problems into such a small adapter, you've made an installation error.

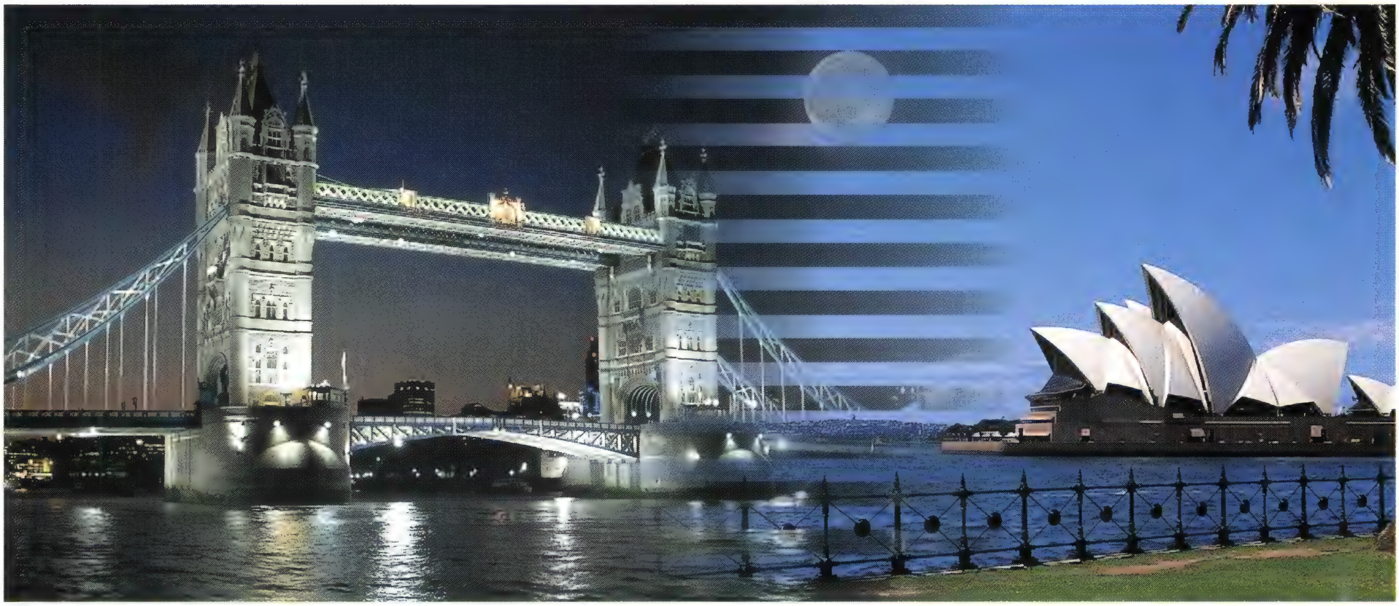
You should have installed Olicom.

olicom

TOKEN-RING SOLUTIONS

Australian Distributor for Olicom: FORCE TECHNOLOGY PTY LTD, P.O. Box 1516 • Dee Why, NSW 2099 • Ph: (02) 971 1000 • Fax: (02) 981 1932

IBM is a registered trademark of International Business Machines Corporation



BRANCH *office* CONNECTIVITY *is* FINALLY *within* REACH

Until today the prospect of integrating a branch office into your corporate network has always seemed hopelessly far off. There are now unparalleled connectivity solutions that bring your branches and headquarters much closer together.

Eicon Technology, a world leader in PC-based connectivity, offers a family of internetworking and host access products for linking remote offices, along with some of the best 3270, 5250 and APPC emulations for use on your favorite PC platform. Eicon's new InterConnect Server extends your Cisco, Wellfleet or IBM backbone network across the enterprise. It fuses traditional router and gateway technologies by integrating LAN interconnection for Novell NetWare and TCP/IP networks, access to any host, as well as conversion and concentration of non-LAN communications—all supported by comprehensive SNMP network management.

If you are interested in connecting your branch offices—whether they are in London, Sydney, or anywhere else in the world—call us or send the adjacent coupon for your Branch Office Connectivity booklet.

ACM (AU)

Please send this coupon to:
Eicon Technology Corporation
Level 14, 33 Berry Street
North Sydney NSW 2060
Australia
Tel: (02) 959 1960
Fax: (02) 959 1980

NAME:
POSITION:
COMPANY:
ADDRESS:
POST CODE: COUNTRY:
TEL: FAX:

New Australian Office

EICON
TECHNOLOGY

Mobile Communications

Mobile Lobby Group Formed

The Government may meet more resistance that it could have predicted over its re-affirmed commitment to phasing out the analogue cellular mobile system from 1996 and switching to GSM by the year 2000.

Rumblings about the Government's position, outlined in Sydney recently by Chairman of the Labor Caucus Communications Committee, Leo Macleay, have come from the Australian Mobile Telecommunications Association (AMTA) whose recent formation signals the maturity of the local industry and its emerging importance.

Founding AMTA member and General Manager of Motorola's Cellular Subscriber Group, Phil Haas, said the Government's commitment to phasing out analogue altogether was causing some concern, given that the system provided excellent coverage and was now used by over a million subscribers, while the number of GSM units in use was estimated to be less than 10,000.

HAAS said that while the issue of GSM electromagnetic interference was now 'manageable,' a very real problem for the Australian industry during the analogue-digital transition was that AMPS and GSM were never designed to be co-located. "GSM was designed for the European analogue standard environment and systems like E-TACS — not AMPS," he said.

MobileNet's National Manager, Tim Herring, said that when the Government accepted an Austel recommendation to switch to GSM digital in April, 1990, there were only around 140,000 analogue subscribers so the impact at that point appeared to be minimal. "But if you talk about transferring well over a million customers it's not very customer friendly," he said.

Herring said an Austel public awareness campaign outlining the benefits of digital GSM, and a gradual drop in the price of digital handsets in the next few years would make the transition easier, but subscribers should still have the ultimate choice.

Representing an industry with an annual turnover of $1.5 billion and growing, AMTA is likely to have a powerful voice in government circles, with mobile telephones presently estimated to be used by 5% of the market and the figure projected to rise to 15% by the turn of the century.

Around 30 companies, including Telecom, Optus, Vodafone as well as manufacturers, resellers, dealers and accessory suppliers, have already joined up and the AMTA expects to have between 60-70 members within two years. The group plans to establish a secretariat, probably in Canberra.

Its interim Chairman is Steve Haritos, CEO of the MHG Group which distributes Audiovox products in Australia.

Supported by the Cellular Dealers' Association of Australia, AMTA had its genesis within the Australian Electronic Industry Association (AEIA), itself a part of the Australian Electrical and Electronic Manufacturers Association (AEEMA).

AEEMA's Executive Director, Alex Gosman, said another issue causing concern within AMTA was uncertainty about the availability of spectrum from the Spectrum Management Agency (SMA).

"Austel's report on personal communications services and networks (PCS/PCN) stressed that there needs to be some predictability in terms of access to spectrum in the future," he said. "The SMA will conduct a review and draft a timetable for the transition to digital next year. But the SMA is committed to selling spectrum based on market demand alone, which introduces a note of uncertainty. The AMTA would generally support the Austel position."

Bernard Levy

THE FUTURE IS HERE!

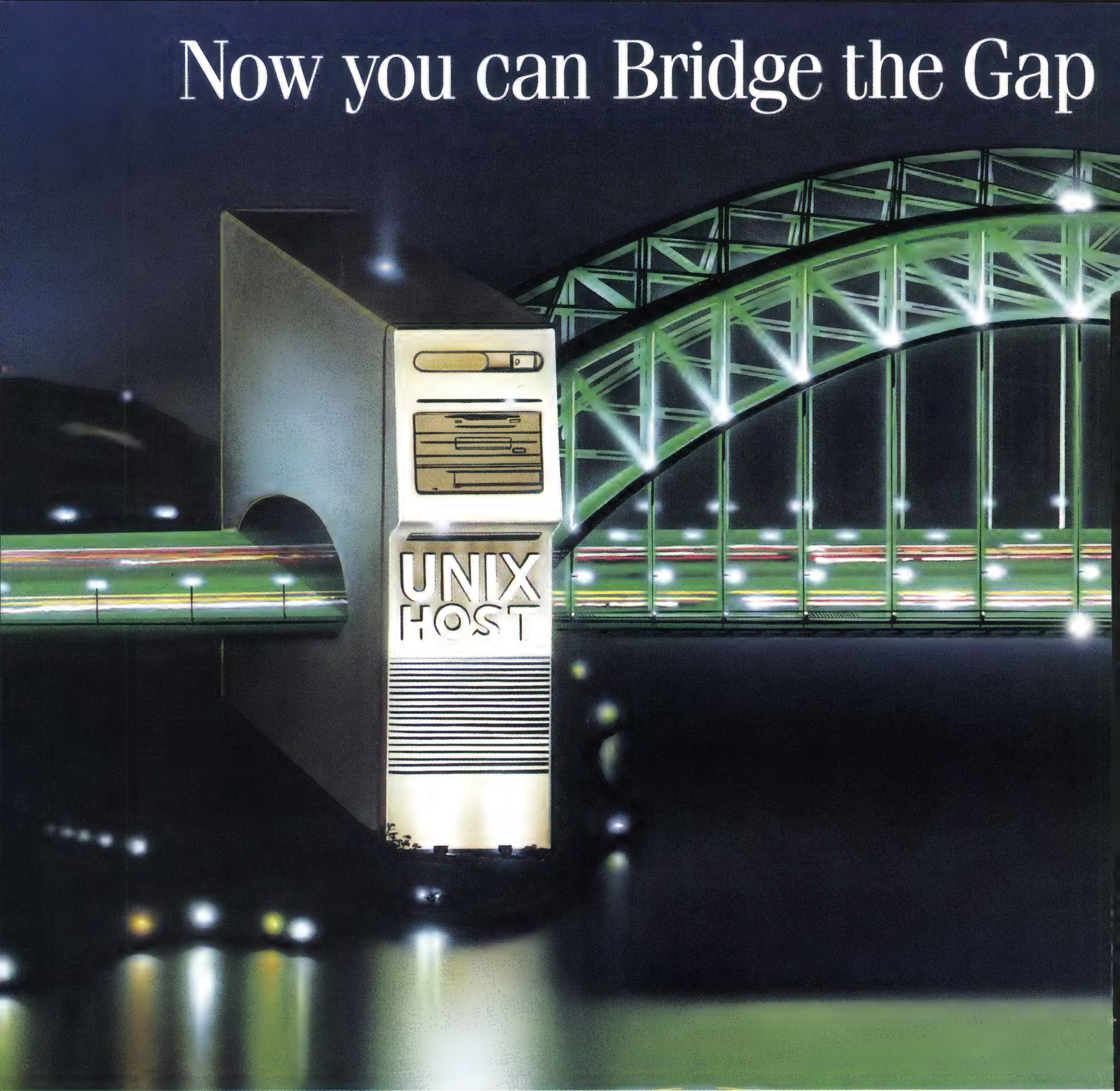
EXPERIENCE THE
MM CABLES OPTICAL FIBRE
NETWORK AT ATUG '94

*Come, see and discuss the products, the innovations and the service that only MM Cables can offer.
MM Cables – Official supplier of optical fibre technology for the Interop Network at ATUG '94.*

CABLES
COMMUNICATION
PRODUCTS
A Division of Metal Manufactures Limited

VIC (03) 541 2400 | NSW (02) 600 0888 | SA (08) 260 6033
QLD (07) 868 0111 | TAS (002) 72 6788 | ACT (062) 806 811

PHOTOSYNTHESIS


Now you can Bridge the Gap
UNIX
HOST

Now with Novell's NetWare NFS and LAN WorkPlace products, you can integrate your computer operating systems to create a single system that works more efficiently.

Novell's NetWare NFS software transparently integrates Unix systems with the NetWare v3.11 environment enabling the NetWare server to provide Network File System file services and Line Printer Daemon print services to Unix NFS clients.

LAN WorkPlace for DOS provides DOS and Microsoft Windows users with concurrent access to Unix systems and other Novell network resources using the TCP/IP protocol suite. Its ease of use, low memory consumption, high performance and reliability make LAN WorkPlace the ideal choice. And there are versions of LAN WorkPlace for OS/2 and MacIntosh.

NetWare NFS and LAN WorkPlace are backed by the extensive resources of Com Tech - Australia's leading Open Systems distributor. Com Tech's depth of expertise in network installations is evidenced by the fact that over 50% of our staff are dedicated to technical service and support. And there are dedicated specialist Novell and Unix technical support teams available to facilitate the smooth integration of your computer system.

So if your organisation is running independent operating systems, bridge the gap with NetWare NFS and LAN WorkPlace.

NetWare® NFS

LAN WorkPlace®

for DOS,OS/2 and Macintosh

NOVELL

For details of your nearest authorised reseller please phone Com Tech on: NSW (02) 317 3088 or (008) 263 954, VIC (03) 696 0770, ACT (06) 257 7695, QLD (07) 832 2699, SA (08) 271 8600, WA (09) 322 5605.

All products referred to by their trade names are protected under the provision of relevant trade marks and patent legislation and accordingly none of the products or the names may be copied in any way without the prior consent of the proprietor. All registered or unregistered trade marks referred to are the property of their respective owners.

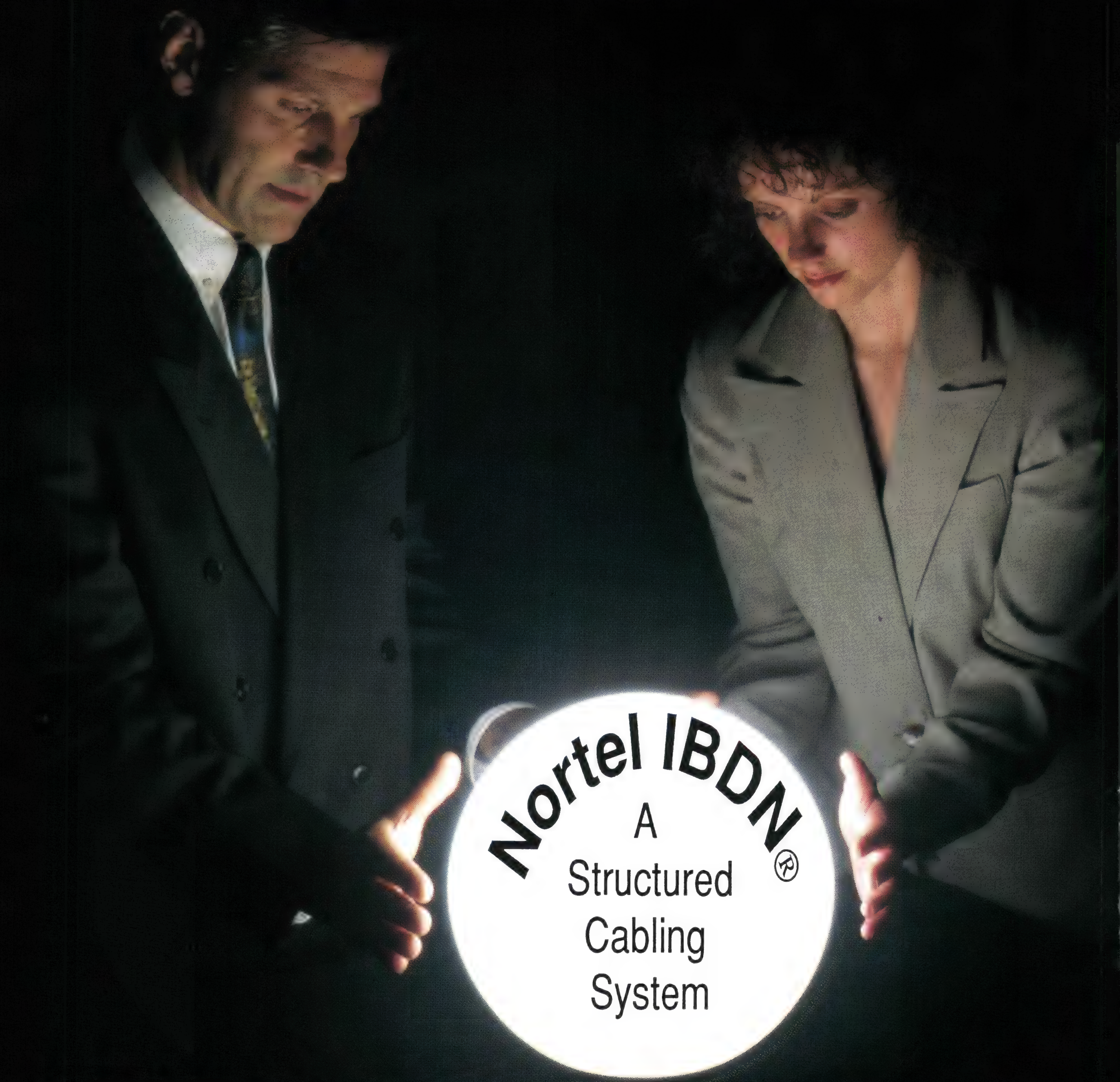
Please rush me more information on Novell NetWare NFS and LAN WorkPlace products.

Name:
Title:
Phone:
Fax:
Company:
Address:
Post Code

Send to: Com Tech Communications PO Box 207, Alexandria NSW 2015 or Fax to (02) 317 3339.

Smith Ross & Muir CT 3660

Looking into the Future...



Available Today for the Technology of Tomorrow & Beyond

• Manufactured by Northern Telecom • Supports 100Mbps and beyond
• Integrated Voice, Video & Data • UL Certified Category 5 components • Austel approved components
• Lifetime System Application Guarantee • 15 Year Warranty on Passive Components

For more information on IBDN ®, or a list of Authorised Certified System Vendors and Resellers Call CableNet, the Authorised National Nortel Distributor

CableNet
6/30 LEIGHTON PLACE, ASQUITH 2077
TEL: (02) 482 7300 • FAX: (02) 482 7311

nt nortel

Mid-level Managers Ease SNMP Information Overload

Weeding out irrelevant SNMP updates helps central consoles pay attention to what's really important.

Is there such a thing as too much network management information? Just a couple of years ago, this question might have gotten a laugh from network operators desperate for a peek inside packets or a spot check on device status. Today, it doesn't seem so funny. SNMP — the de facto management standard — is terrific at gathering statistics and reporting alarms. In fact, it may be too good, which can result in instant information overload at the central console as thousands of far-flung bridges, routers, hubs, and workstations dutifully call in. Ask anyone who's seen one failed router trigger alarms from all attached devices and then spent hours trying to find the real cause of the problem.

And as networks grow, extending SNMP's reach across the wide area can run into money. Every time the management console asks a question or a remote device wants to respond, it means a phone call.

But a group of new applications known as mid-level managers should go a long way to unclogging the lines of communications. These applications, which reside in or near managed devices, sift through the information gathered by SNMP agents, selectively forwarding only what the management console needs to know. And development tools are coming that should pave the way for even more mid-level managers.

Finding the Middle

All mid-level managers comprise software that resides inside a device, where it gathers information about the network. But vendors are taking a variety of approaches to these products. Hewlett-Packard, IBM, and NCR put their intelligent agents on Unix workstations and the management application on the central console. Cabletron Systems and SynOptics Communications put their intelligent agents in hubs, while 3Com places its agents in hubs, bridge/routers, and PC adaptor cards (see the table on page 35). Management software runs on the central console or attached workstations.

According to many vendors, mid-level managers shift processing pressure off the central platform, while adding local intelligence to remote sites. Since these products are just starting to ship, it's not yet possible to gauge their effectiveness. Still, their potential benefits are compelling. SynOptics, for example, claims that tests of its Superagent mid-level manager indicate that local SNMP polling can reduce WAN bandwidth by up to two thirds.

What's more, since fewer devices report to a mid-level manager than to a central console, the local application can apply more intelligence to solving problems.

Vendors of mid-level management products say it's likely that, as time passes, their products will become focal points for automation and other self-healing capabilities.

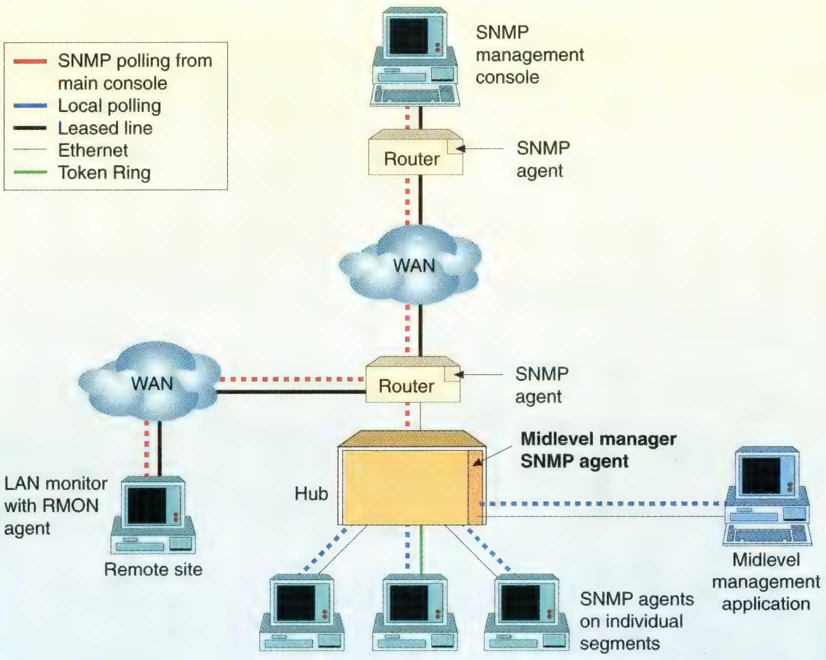
As noted, some mid-level managers reside in hubs or other network devices. SynOptics' Superagents, for instance, comprise Unix-based applications that run on the hub management modules inside SynOptics hubs. The Superagents are downloaded into the modules from SynOptics' Optivity hub management software, which runs standalone or can be integrated with Sunnet Manager, HP OpenView, and IBM NetView/6000. Superagents perform their own analysis but need Optivity or other management applications to display their findings.

3Com's Transcend Smartagents come bundled with the management modules for its hubs, and in firmware on the vendor's bridge/routers and Ethernet or Token Ring network adaptor cards. Each Smartagent gathers information about its host device and then decides what to forward to 3Com's Transcend management application. Some Transcend applications are integrated with popular management platforms and some run standalone. Unlike SynOptics' Superagents, 3Com's Smartagents rely on Transcend management applications to analyse the data they gather. In effect, a Transcend application is a part of the Smartagent itself.

Cabletron's Distributed LAN Monitor furnishes status information about devices attached to Cabletron hubs. Cabletron also has more sophisticated mid-level managers for its Spectrum management platform.

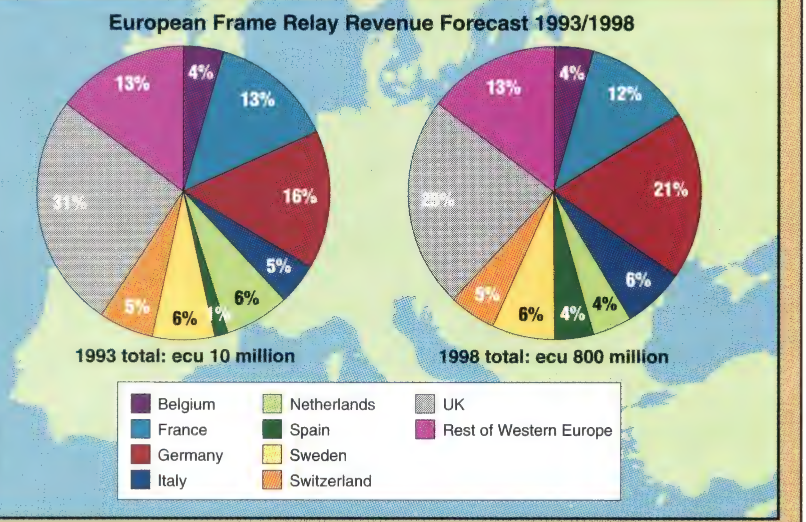
The Poll Stops Here

Mid-level managers intercept SNMP information and decide which data to forward to the central console, thus helping save on WAN bandwidth.

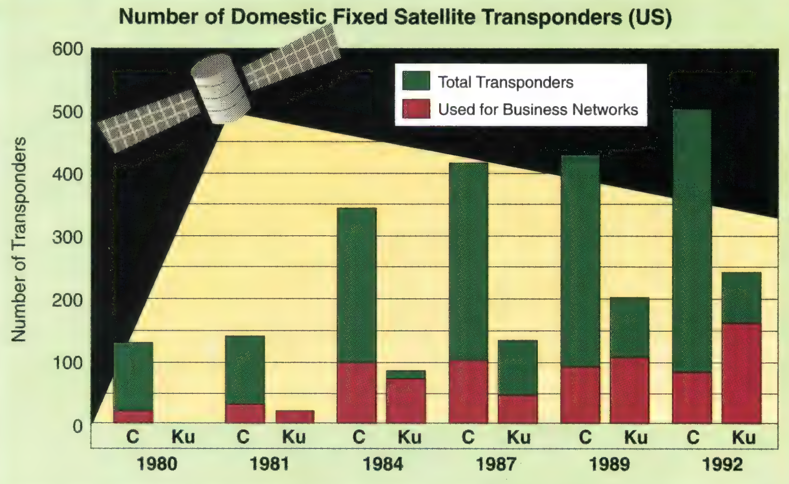


🟥 SNMP polling from main console
🟦 Local polling
▬ Leased line
— Ethernet
🟩 Token Ring
SNMP management console
Router
SNMP agent
WAN
WAN
Router
SNMP agent
Midlevel manager SNMP agent
Hub
LAN monitor with RMON agent
Remote site
Midlevel management application
SNMP agents on individual segments

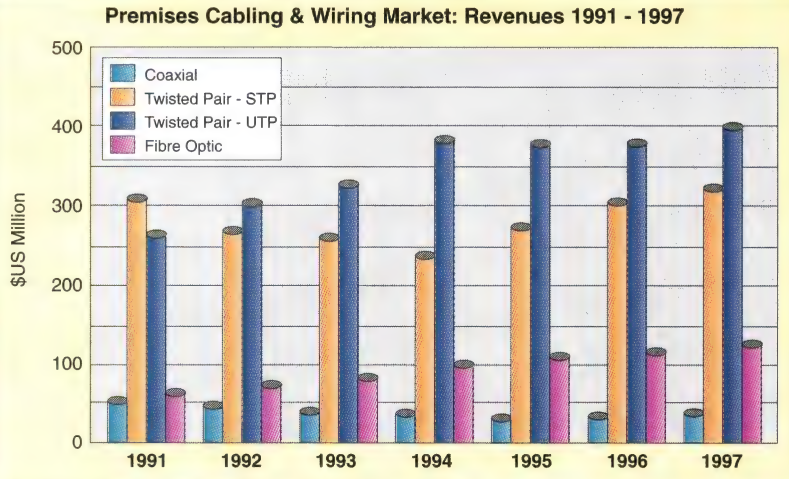
Market Watch


European Frame Relay Revenue Forecast 1993/1998

Source: Ovum


Number of Domestic Fixed Satellite Transponders (US)

Source: Frost & Sullivan Market Intelligence *Note: All figures are rounded*


Premises Cabling & Wiring Market: Revenues 1991 - 1997

Source: Frost & Sullivan Market Intelligence *Note: All figures are rounded*

Double Dealing

A key characteristic of these sorts of mid-level managers is that they act both as agents and managers. Like managers, they poll devices at regular intervals. Like agents, they run inside a hub, bridge/router, or even on a network adaptor card, gathering MIB (management information base) data on request. But SNMP managers poll all network devices. Mid-level managers, in contrast, are much more selective, checking only certain types of devices, certain parts of the network, or certain kinds of SNMP MIB variables. And SNMP agents merely gather information to be dumped to the console on request (or in the event of trouble). Mid-level managers can analyse data, and they can contact the management station without being polled first.

Despite superficial similarities, though, mid-level managers don't really have that much in common. SynOptics' Superagents, for instance, are geared to gathering information from a variety of network devices, including third-party devices attached to SynOptics hubs. 3Com's Transcend Smartagents, in contrast, gather data only from 3Com devices in user-specified workgroups or geographic domains.

SynOptics markets several Superagents to collect specific type of management information. The Topology Superagent gathers data about IP network configuration. The Asset Superagent accumulates data about the addresses, MIBs, and interfaces of each device on the network. The Fault Correlator Superagent sifts SNMP traps, reporting only those that represent the source of trouble.

SynOptics also has repackaged several applications that formerly ran with Optivity as Superagents. These include Trendman, which isolates key trends in network traffic, Policyman, which provides security control for workgroups, and Routerman, which helps users track network performance by mathematically comparing the data gathered by MIB variables associated with different types of routers.

The activities of all Superagents are coordinated by a request broker in Optivity. For example, when a user selects a view of the network topology, Optivity checks to see which Superagent in the system is equipped to handle the request. It then asks the appropriate Superagent — in this case, the Topology Superagent — to find the location of the MIB variables, and poll the devices and send information back to the management application.

3Com has taken a different tack. Each Smartagent keeps tabs on one specific device. The Transcend applications analyse and display information from Smartagents. Each Transcend application is teamed with a particular type of Smartagent: NetBuilder Manager 2.0, for instance, fathers data from 3Com bridge/routers.

Selected Hierarchical Management Products

VENDOR	PRODUCT	DESCRIPTION	MANAGEMENT SYSTEM
Cabletron Systems (02) 959 5900	Distributed LAN Monitor	Intelligent agent and application for Cabletron hubs	Cabletron Spectrum and RemoteLANview Windows
Hewlett-Packard 13 13 47	HP OpenView Operationscentre	Information correlator for workstations and attached devices; includes console software for HP/UX and intelligent workstation agents for HP/UX, AIX, SunOS	HP OpenView
IBM 13 24 26	IBM Systems Monitor/6000	Information correlator for workstations and attached devices; includes console software for AIX and intelligent workstation agents for AIX, HP/UX	IBM NetView/6000
AT&T Global Information Solutions (02) 964 8111	Starsentry Computer Manager and Agent	Application correlates SNMP fault messages from multiple workstations; includes console software for NCR systems and agent software for NCR, IBM, HP, Sun and Unisys workstations	Any SNMP management station
SynOptics Communications Com Tech (02) 317 3088	Superagents (Asset, Fault Correlator, Topology, Trendman, Policyman, Routerman)	Intelligent agents for SynOptics hubs	Via SynOptics' Optivity; on Sunnet Manager, HP OpenView, IBM NetView/6000
	Global Enterprise Management (GEM) Applications (Asset Manager, Vision Desktop)	Applications for displaying information from SynOptics' Superagents	Netlabs/Manager, Sunnet Manager
3Com (02) 959 3020	Transcend Smartagents	Intelligent agents for 3Com hubs, bridge/routers, and Token Ring or Ethernet adaptors	Any SNMP management station
	Transcend Applications (Transcend NetBuilder Manager 2.0, LinkBuilder Multi-Services Hub [MSH] Manager, Flexible Media Hub [FMH] Manager, and Tokenlink Smartagent)	Unix-based applications that interpret information from 3Com Smartagents	Sunnet Manager (NetBuilder Manager 2.0, LinkBuilder MSH Manager, FMS Manager); any SNMP station (Tokenlink Smartagent)

Transcend allows users to choose to view Smartagents in a workgroup, on the backbone, at remote offices, or on the WAN. Users enter information about the devices in each group, and Transcend sets up the view.

Parties of the Third Part

Right now, the mid-level managers from SynOptics and 3Com are geared to networks based on proprietary equipment. True, third-party devices not directly attached to the hub will work with SynOptics Superagents via Optivity — to a limited degree. But such equipment must belong to one of the categories that Superagents recognise. 3Com's Transcend applications won't work with any device that isn't equipped with a Smartagent.

Both SynOptics and 3Com have published the MIBs for their intelligent agents. Thus, third parties can incorporate them into management applications, just as they would any other kind of MIB. The first vendor to actually do this is Netlabs, whose Asset Manager and Vision Desktop use SynOptics' Superagent information. Both run on Sunnet Manager or Netlabs' Netlabs/Manager platform, and SynOptics and Netlabs both plan on marketing them.

Workstation-based mid-level managers have far more in common with one another. Hewlett-Packard's Openview Operations centre and IBM's Systems Monitor/6000, for example, both consist of an agent that runs on a Unix system, correlating information about network and system activity and selectively reporting it to a management platform.

But these sorts of mid-level managers not only monitor devices attached to a Unix host, but also the host itself. Further, they gather information about both the physical and the system management aspects of a network — including memory, interfaces, and applications running on workstations and servers. HP's Operations centre, for instance, keeps tabs on the use of licensed software on a network. And IBM's systems Monitor/6000 provides data about users associated with a particular system.

This sort of double vision requires workstation-based mid-level managers to support multiple agents on one Unix system — something SNMP does not allow. To get around the problem vendors often rely on non-standard methods to get the job done. IBM implements a version of SNMP Multiplexer (SMUX), an experimental technique the IETF (Internet Engineering Task Force) never actually approved as a full standard. And Hewlett-Packard uses RPCs (remote procedure calls) to link its Operations centre agent with the central console. (HP says this is a plus, because it allows the central console to quickly update an intelligent agent).

Because workstation-based mid-level managers use nonstandard techniques to gather data, other systems can't use MIBs to access their information. Instead, developers must employ the APIs (application program interfaces) associated with the manager's central console.

SNMP Version 2, which right now is a proposed standard before the IETF, contains a facility that lets one management station communicate with multiple agents through one IP address. This opens the way for a standard approach to agents that gather both network and system management information. Further, SNMP Version 2 establishes a way for traps sent from one manager to another to be acknowledged. This device should help ensure reliable communications between mid-level managers and platforms.

Mary Jander

Multiprotocol Software

MPTN Means Multiprotocol Without Routers

Multiprotocol routers may be the preferred building blocks for most corporate networks, but sometimes they just aren't practical. Cost is a very real concern when it comes to this type of equipment. And in some instances, even if the price isn't a problem, software for the requisite protocols may be unavailable.

IBM may have the answer for corporations that can't afford to move their networks to multiprotocol routers as quickly as they'd like. Its new Multi-Protocol Transport Network (MPTN) software decouples applications from underlying transport protocols. MPTN software can be installed on individual clients or on a server or a gateway, and to some degree compensates for the differences between protocols.

This means that a distributed application written to communicate with one protocol can actually work with other protocols — with no change to the application (see Figure 1). Thus, applications can be chosen according to merit, rather than basing a decision on which protocols are supported. What's more, the purchase of multiprotocol routers can be put on hold temporarily and the functional life of single-protocol bridge/routers, X.25 switches, and similar gear can be extended.

Even if a multiprotocol network is in place (and routers are available), net managers can employ MPTN to reduce the total number of protocols, thus (theoretically) simplifying management.

Beyond Big Blue

IBM also has talked about getting other vendors, including Hewlett-Packard and Apple, to build their own MPTN software, realising that it alone can't come up with every version of MPTN necessary. But the success of these efforts is by no means guaranteed. MPTN is late to market and may be regarded by many corporations as too kludgey to serve as the linchpin of an enterprise network.

IBM doubtless realises that MPTN faces an uphill battle — or is at least hedging its bets — since it continues to refine its 6611 multiprotocol routers. MPTN still needs a lot of work if it's going to play a role on today's internetworks. Thus far, the software supports SNA and TCP/IP, the industry's most common protocols, and OS/2 and MVS, IBM's operating systems. For MPTN to really catch on, however, IBM must add more protocols and platforms — and that's exactly the plan.

IBM has designated MPTN as part of its Networking Blueprint, announced in March 1992, a top-to-bottom architecture that includes middleware, APIs, and transport protocols. Although MPTN was not explicitly shown in the Blueprint *per se*, it is built on one of the technologies announced as part of the architecture, the Common Transport Semantics (CTS).

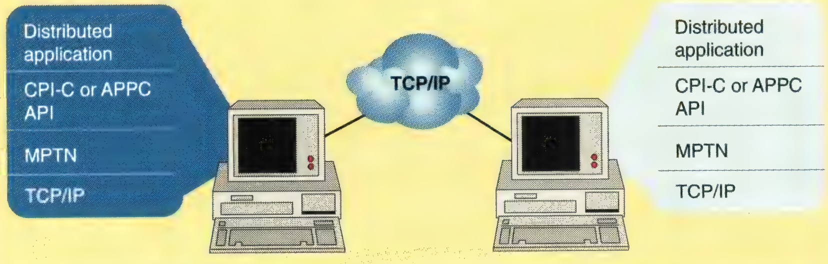
Working Together

As mentioned, MPTN's primary function is to make applications independent of underlying transport protocols. It's also intended to ensure that applications are interoperable. For example, programs that utilise IBM's CPI-C (Common Programming Interface for Communications) API (application program interface) and the SNA LU6.2 protocol could, if MPTN were installed, continue to be used even if the only available transport were a TCP/IP network. By the same token, two programs written to the Sockets API and running on TCP/IP could be moved unmodified to sites where SNA is the only available transport.

MPTN also can be used to reduce the number of protocols on a network and eventually may even eliminate parallel networks, since its purpose is to allow any applications to work with any protocol. Consider a bank with SNA links to automatic teller machines in branch offices. As more platforms and protocols are added, MPTN should make it possible for the organisation to install new Unix or NetWare applications at the branch offices and link them to headquarters over the SNA network instead of deploying a second, parallel network.

Figure 1: Redistributing an Application

By decoupling applications from underlying transport protocols, IBM's Multi-Protocol Transport Network (MPTN) allows a distributed application written for one protocol to work with others - without changing the application.



API = Application Program Interface
APPC = Advanced Program-to-Program Communications
CPI-C = Common Programming Interface for Communications
MPTN = Multi-Protocol Transport Network

In some instances, MPTN can serve as an alternative to multiprotocol routers. But it also can complement the multiprotocol routers on an internetwork. Rather than furnish a way for applications to run over any transport protocol, routers strive to support any protocol an application may use.

Recognising that customers may already have single-protocol segments in their networks, router vendors also have equipped their products with encapsulation capabilities that perform functions similar to MPTN. For example, some routers encapsulate SNA in TCP/IP, allowing it to be transmitted over networks that only support the latter. The SNA traffic is encapsulated by the transmitting router and taken out of its TCP/IP envelope by the receiving unit.

A few routers venture even further onto MPTN's turf, actually converting one protocol into another. Cisco Systems, for example, offers built-in SDLC (synchronous data link control) conversion on some of its boxes, which translates so-called unroutable SDLC traffic into LLC2.

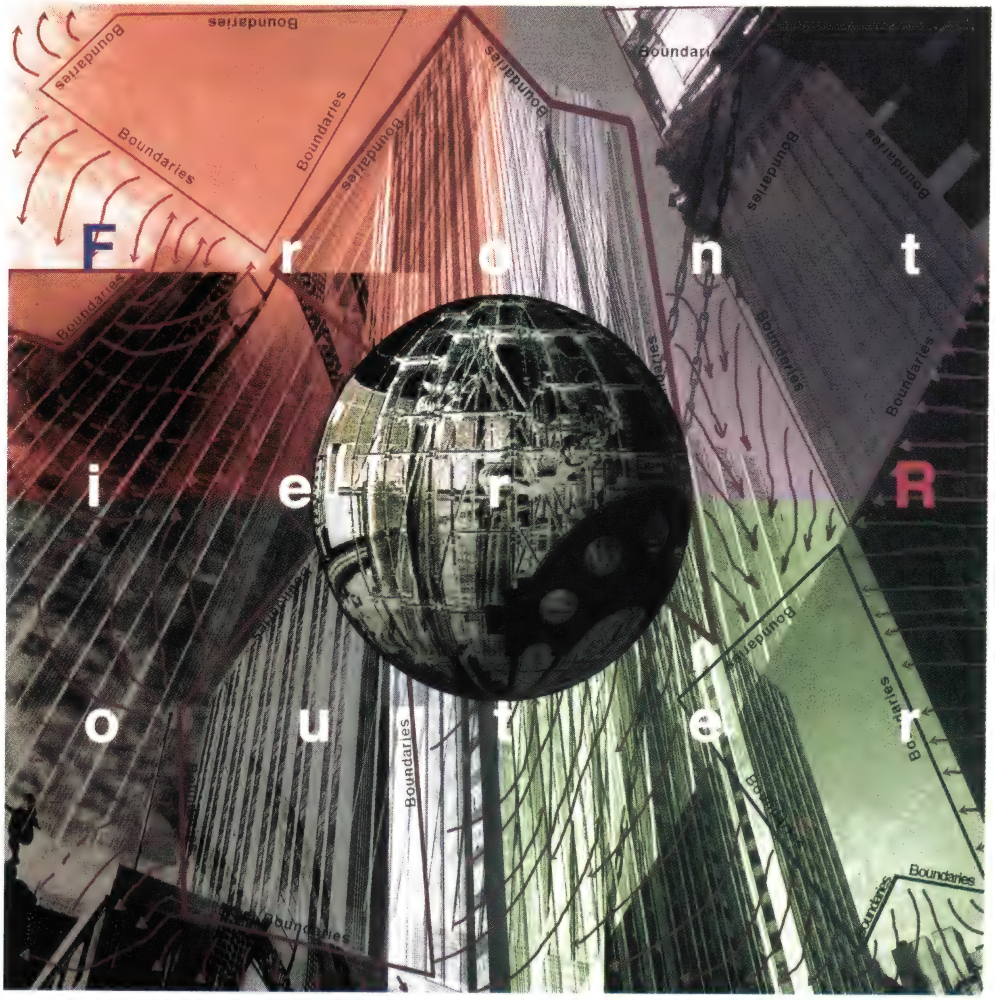
MPTN actually falls somewhere between encapsulation and conversion. In operation, the software changes the transport header but not the application header or payload. The application believes that traffic is being sent via the native transport, even though it really isn't.

Middleware also could be viewed as an alternative to MPTN. Some messaging middleware products offer some protocol translation. The major differences between MPTN and conventional messaging middleware is that MPTN works with existing APIs rather than furnishing its own.

MPTN software resides either on end-stations or on intermediate nodes. When it's running on end-stations — access nodes, in MPTN parlance — the pieces of a distributed application communicate on a peer-to-peer basis. The MPTN software on each end-station intercepts data from the associated network software, swaps out the transport header, and then sends the data on its way — completely transparent to the application.

When MPTN software is located on the intermediate nodes, it's operating in what IBM terms 'gateway mode.' With this setup, only the client and the gateway need to run MPTN software. It does not have to be installed on every end-station. This configuration makes it possible for one part of a distributed application running on, say, a TCP/IP network to communicate with an-

If you have a network with Remote Requirements, you need to know about is CAMEO's C.O.F.R.A..



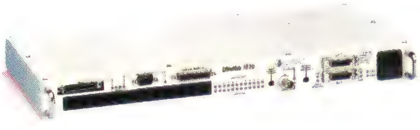
Traditional routers at a remote office are expensive, complex, and require technical expertise. Introducing Frontier Router from CAMEO, offer you a most cost-effective and simple way to add branch offices to your corporate network.

C.O.F.R.A

CAMEO Frontier Router conforms to Cameo Open Frontier Routing Architecture. COFRA, which combines the functionality of a hub, remote bridge and remote access router in one box. The Frontier Router deals with a very simply routing choice: either local or remote.

Simplicity Means Easy Maintaince

Now installing and maintaining your branch office network become so easy. You can reconfigure your branch office networks by changing only the central router. Plug and Play, and no need to touch the remote sites.



CAMEO Frontier Router-UltraHub 1030

For more information on CAMEO hub product please fill out the following form and fax: **CAMEO U.S.A. 603-888-8906** or **Asia 886-2-704-5138**

Name: ______________________

Company: ______________________

Address: ______________________

____

Telephone: ______________________

Fax: ______________________

CAMEO

The Better Alternative

CAMEO Communications Inc.
71 Spit Brook Rd., Nashua, NH 03060, U.S.A.
1-603-888-8869, **FAX:**1-603-888-8906
PAM-Asia: 886-2-704-5122,
FAX: 886-2-704-5138

other piece on an SNA network. The two networks could be connected via a PC or workstation running MPTN and equipped with two protocol stacks (see Figure 2 on page 39). There is no need for a multiprotocol router.

Gateway Goals

Gateway mode is most useful in point-to-multipoint configurations, such as when a number of clients need to link to a server. There's no need to install MPTN on the server, as long as it is running on all end-stations and on the gateway.

The functions that MPTN must perform to establish these sorts of connections can be roughly divided into two basic categories — address mapping and formatting and service compensation among transports.

Address mapping makes it possible for a node that supports one protocol to send a message to a node that uses a different protocol. The mapping function, for instance, translates the SNA address specified by a sending application into a TCP/IP address, thus allowing an application to specify a destination address in its native format and find and access that device across a different transport. MPTN maps addresses dynamically, rather than requiring net managers to manually configure address associations.

Bridging the Gap

Service compensation bridges the gap between the needs of the application and the capabilities of the transport protocol. For example, an SNA application sends data in record format (one logical section at a time) while TCP/IP ships a continuous stream. MPTN furnishes TCP/IP with whatever services it needs to handle record formatting.

Alternatively, TCP/IP applications can send multicast messages, since multicasting is not supported by SNA. Here, MPTN will supply SNA with the services it needs to handle multicast messages.

MPTN has great potential, but corporations need to understand its shortcomings. At first glance, some users may even feel that instead of eliminating the problems associated with multiprotocol transport, MPTN adds another layer of complexity.

There's nothing inherent in MPTN to justify the belief that it would be anything less than reliable when it comes to accommodating various protocols. MPTN, in fact, is intended to reduce the number of protocols and thus simplify management and ensure consistent performance. It is true that MPTN is as yet unproven, but there's no reason to suspect that it will be in any way inferior to multiprotocol routers.

Actually, limited support for platforms and protocols are an obstacle in MPTN's path. The software allows applications written to the Sockets API (Sockets is commonly associated with Unix and TCP/IP) to communicate over SNA LU6.2 protocols, and applications written to SNA's APPC or CPI-C to communicate over TCP/IP.

IBM, however, has announced its intentions to support other protocols, including LU0, LU1, LU2, and LU3, over TCP/IP. In theory, this will enable CICS applications to run on TCP/IP networks without modification. IBM also has said it will support APPC over TCP/IP for OS/400, APPC over TCP/IP for AIX on RS/6000 workstations, and Sockets over SNA for AIX on RS/6000s.

Software that supports all these platforms and protocols will greatly enhance users' abilities to attain any-to-any connectivity. Writing all the software is a big task for IBM; support from third-party vendors would be nice, but, as mentioned, few third-parties have announced support.

Corporations considering MPTN also should be aware of a number of technical shortcomings. For one thing, MPTN does not allow every application written to any Sockets interface to run over SNA. (There are many versions of Sockets, just as there are many versions of Unix.)

We came. We s

Of course, we're not normally ones to boast, but in this case, it's too hard to resist. Recently, *Communications Week* tested several internetworking devices in multi-protocol environments. 3Com's NETBuilder II® earned a perfect score in every single test scenario. The first perfect overall score recorded. Anything they could dish out, this router could take.

Surprised? We weren't. After all, NETBuilder II was designed to be the most powerful, flexible router made.

So powerful, its advanced RISC processor and high-speed bus make it one of the industry's top performers. At a price that's almost a third less than our biggest competitor.

And so flexible, it can support Novell's IPX, AppleTalk,

First Perfect Ove

Cisco device takes a licking, but 3Com bridge-router keeps on ticki

By EDWIN E. MIER AND CHRIS GIULIANO

When bridge-routers from Cisco Systems Inc. and 3Com Corp. were evaluated for this installment of *Communications Week*'s mixed-LAN test program, it was 3Com's NetBuilder II that carried home the awards.

In fact, the NetBuilder II is the only bridge-router among the six tested to date in our series to command a perfect score for all test scenarios.

The NetBuilder II successfully handled the worst traffic scenarios we could throw at it, without skipping a bit.

That performance, coupled with a price tag that is considerably lower than many other market leaders', 3Com's bridge-router an lent choice for users in necting token-ring and E LANs.

In performance, Cisc bridge-router clearly l hind the 3Com devic MGS—a product that, older than the vendor's 7000 series bridge-rou still marketed by Cis tested both at a user si our labs, despite the decision not to particip test program.

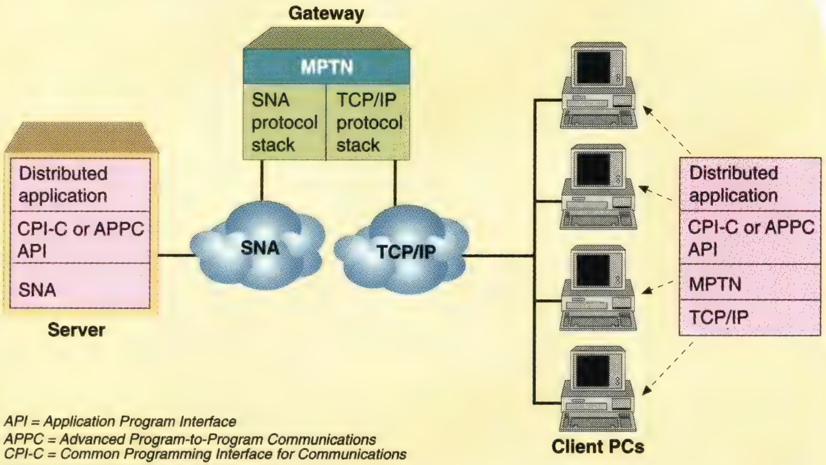
The Cisco bridge-r most adept at process net and Novell Inc. Int Packet Exchange traff handle the maximum DECnet traffic load in of the test scenarios

Testi

©1993 3Com Corp. (408)764-5000. 3Com, Networks That Go the Distance, and NETBuilder II are trademarks of 3Com Corp. ©1993 CMP Publications, Inc.,

Figure 2: Going Through the Gateway

With MPTN operating in gateway mode, only the client and gateway need to be loaded with the requisite software. This is particularly useful in point-to-multipoint configurations, such as when many clients need to access a server.



API = Application Program Interface
APPC = Advanced Program-to-Program Communications
CPI-C = Common Programming Interface for Communications
MPTN = Multi-Protocol Transport Network

In theory, MPTN should allow each end-station to have only one protocol stack. For Sockets over SNA this is true. Only an SNA protocol stack is needed; MPTN includes a Sockets library so that TCP/IP is not required. But for IBM's SNA (APPC or CPI-C) over TCP/IP implementations, two protocol stacks must be maintained. When OS/2 is the operating system, TCP/IP and IBM's Communications Manager must both be present.

Similarly, the MPTN implementation of MVS requires TCP/IP for MVS and VTAM. Nevertheless, MPTN users still get the principal benefits associated with the software — the ability to communicate using different and (in some instances) fewer protocols — although they may be required to manage dual protocol stacks.

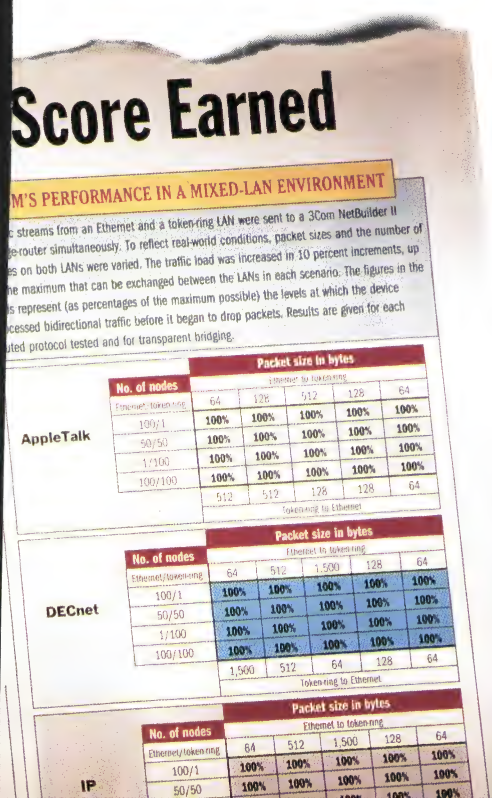
MPTN should be enhanced in a number of ways that would make it an even more useful tool. True, it decouples distributed applications from protocols, but the applications must be written to the same API. If different APIs are used, applications cannot communicate. In other words, a program written to CPI-C cannot send a message to a program written to Sockets. Support for such communications represents a logical enhancement to MPTN. A version of MPTN also is needed for 3174 communications controllers, which would allow 3270 terminals to communicate with hosts using TCP/IP or other protocols.

If all these enhancements are made — and if IBM follows through aggressively on its plans to write versions of MPTN for more platforms and protocols — the technology could be very successful. X/Open seems to be looking favourably on IBM's proposal to adapt MPTN to XTI and it's likely to do so. This sort of support may go a long way toward putting MPTN on the map.

Max Dolgicer

---

aw. We routed.



Score Earned

M'S PERFORMANCE IN A MIXED-LAN ENVIRONMENT

c streams from an Ethernet and a token-ring LAN were sent to a 3Com NetBuilder II ge-router simultaneously. To reflect real-world conditions, packet sizes and the number of es on both LANs were varied. The traffic load was increased in 10 percent increments, up he maximum that can be exchanged between the LANs in each scenario. The figures in the s represent (as percentages of the maximum possible) the levels at which the device cessed bidirectional traffic before it began to drop packets. Results are given for each uted protocol tested and for transparent bridging.

AppleTalk

No. of nodes	Packet size in bytes				
	Ethernet to token-ring				
Ethernet/token-ring	64	128	512	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%
1/100	100%	100%	100%	100%	100%
100/100	100%	100%	100%	100%	100%
	512	512	128	128	64
	Token-ring to Ethernet				

DECnet

No. of nodes	Packet size in bytes				
	Ethernet to token-ring				
Ethernet/token-ring	64	512	1,500	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%
1/100	100%	100%	100%	100%	100%
100/100	100%	100%	100%	100%	100%
	1,500	512	64	128	64
	Token-ring to Ethernet				

IP

No. of nodes	Packet size in bytes				
	Ethernet to token-ring				
Ethernet/token-ring	64	512	1,500	128	64
100/1	100%	100%	100%	100%	100%
50/50	100%	100%	100%	100%	100%

IBM NetBIOS/NetBEUI, Banyan VINES, DECnet, XNS, OSI, and TCP/IP protocols. Not to mention any LAN or WAN media, including FDDI and other high-speed media that come along.

NETBuilder's modular design means interface, media, topology, and technology changes can be made in no time. Plus, hot-swappable modules make network problems easy to repair, with absolutely no interruption in service. In fact, meantime board replacement is less than five minutes. Want to know more about NETBuilder II? Give us a call at **(02) 959-3020, ext. 20.**

We'll send you a copy of our perfect test results, and show you the most powerful way to conquer your internetworking needs.

3Com®

Networks That Go the Distance

Manhasset, NY 11030–reprinted from *Communications Week*, June 7,1993. All other trademarks are those of their respective owners.

Enterprise E-Mail

E-Mail Integration: Forging a More Perfect Union

Now that electronic mail has evolved from the electronic Post-it note stage to become a primary means of inter-office and inter-corporate communication, for most organisations e-mail integration no longer is a matter of choice — it's essential to long-term survival. Consequently, network managers now face the daunting task of integrating any number of different e-mail systems in a single enterprise-wide entity.

Depending on the number and types of e-mail systems that have taken root in a given organisation over the years, the price tag for that survival can be steep. Big companies with mainframe, minicomputer, and LAN-based e-mail systems scattered across the computing landscape could easily spend millions of dollars to unite those systems in a single infrastructure. If that money isn't spent wisely, an even higher price can be exacted in the form of uneven or unpredictable integration levels resulting from overmatched e-mail gateways and undue management strains caused by an over-abundance of integration products.

More than a dozen vendors now offer products aimed at uniting disparate e-mail systems into a homogeneous, enterprise-wide messaging environment. The products range from PC-based standalone gateways that link two discrete e-mail environments, to complete turnkey offerings that include the directory and backbone transport technology needed to connect any number of e-mail systems to one another. Products also differ according to the scope and sophistication of the links they provide; for instance, some offer exceptionally tight integration for a limited number of e-mail packages, while others take a broadbrush approach, bringing general connectivity to a wider product range. Some makers of integration products even rely on third-party packages for their links to certain e-mail platforms.

Because of all the factors and variables involved in e-mail integration, no two products or approaches are exactly alike. Just about every vendor can claim a niche in which its offering is a price/performance leader. That means it's up to prospective users to sort through the available options to find the best match with their respective e-mail setups.

E-Mail Integration: The State of the Art

	PRODUCT	PRODUCT TYPE	BANYAN VINES	DEC ALL-IN-1	HP DESK MANAGER	IBM OFFICE-VISION/400	IBM OFFICE-VISION/MVS	IBM OFFICE-VISION/VM
Alisa Systems Praxa (02) 957 5607	Alisamail	Multigateway switch	●	🔴 🟢	●	●	●	●
AT&T Global Information Solutions (02) 964 8111	Starpro enterprise and MS Mail for Stargroup	Distributed switch, message and directory backbone, Message Store	🔴 🟢 🟣	🟢 🟣 88	🔴 🟢 🟣	●	●	🟡
Digital Equipment Corporation (02) 561 5252	DEC Mailworks, Mailbus, X.400, X.500, SMTP	Distributed switch, message and directory backbone, Message Store	🟢	🔴 🟢 🟣	🟢 🟣 88	🟢	🔴 🟢 🟣	🔴 🟢 🟣
Hewlett-Packard 13 13 47	Openmail, X.400, X.500, SMTP	Distributed switch, message and directory backbone, Message Store	●	🟣 88	🔴 🟣	🟡	🟡	🟡
Isocor Datacraft (03) 727 9111	Isogate 400, Isoplex Message Server, Isoplex DS, X.400 Lite	Standalone gateway, multigateway switch, message and directory backbone	🟡	●	🟡	🟡	🟡	🟡
Novell (02) 925 3000	NetWare Global MHS with products and gateways	Standalone gateway, message and directory backbone	🟡	🟡	🟡	🟡	🟡	🟡
Retix (03) 563 4333	Openserver 400, MH-5420, MH-6000 and MG series gateways	Standalone gateway, message and directory backbone	🟡	●	●	●	●	●
Soft-Switch Software Distribution International (02) 906 8600	Enterprise Mail Exchange and Central	Multigateway switch,distributed switch, message and directory backbone	🔴 🟢	🔴 🟢 🟣	🔴 🟢	🔴 🟢	🔴 🟢	🔴 🟢
Wollongong Group Techway (02) 975 2122	Pathway Messaging Services	Message and directory backbone	●	●	●	●	●	●
Worldtalk Corp Datacraft (03) 727 9111	Worldtalk 400	Standalone gateway, distributed switch	●	●	●	🟡	🟡	🟡

● Connection made by X.400 🔴 Allows both text and binary attachments 🟢 Directory Synchronisation 🟡 Integration via third party product

To help with this selection process, a request for information (RFI) process was undertaken involving the leading vendors in the e-mail integration market for this article. Vendors responding to the RFI were asked to provide information about the gateway, mail transport, and directory products and strategies for each of those systems.

As part of the RFI, providers of e-mail integration systems were asked to identify their level of support for specific e-mail environments. The RFI focused on the most widely used e-mail systems: Vines from Banyan Systems; All-In-1 from DEC; HP Desk Manager from Hewlett-Packard; SNADS (SNA Distribution Services) and Officevision/400, /MVS, and /VM from IBM; cc:Mail and Notes from Lotus Development; Mail for Macintosh and Mail for PC from Microsoft; MHS (Message-Handling Service) from Novell; and WordPerfect Office from WordPerfect. E-mail integration vendors also were asked to specify their level of support for industry-standard message and directory transport technologies, including X.400, X.500, and the Internet's SMTP (simple message transfer protocol). Finally, suppliers were asked whether their products handled document conversion between applications (such as files generated by different word-processing or graphics packages).

Integration Basics

E-mail integration systems have two core components: gateways and backbones. Although some products contain both, others are limited specifically to one or the other.

On the gateway side, e-mail integration products fall into three general categories: standalone gateways, central multigateway switches, and distributed multigateway switches. The simplest type of e-mail integration product is the standalone gateway, which links two e-mail systems. Standalone gateways typically run as software on PC or workstation hosts. In passing e-mail between two systems (for instance, between Lotus cc:Mail and Microsoft Mail for PC), the gateway handles the necessary protocol and format conversions to ensure that the mail gets through in readable form.

The main strengths of standalone gateways are their relative low cost and ease of use. However, those benefits only apply for simple networks with relatively few sites and no more than two or three different e-mail systems. If more than three different systems are involved, setting up and maintaining standalone gateways to connect all those systems becomes problematic, because a separate gateway link is required for each pair. For instance, connecting four e-mail systems requires six gateways.

IBM SNADS	LOTUS CC:MAIL	LOTUS NOTES	MICROSOFT MAIL FOR MACINTOSH	MICROSOFT MAIL FOR PC	NOVELL MHS	WORDPERFECT OFFICE	SMTP	X.400	X.500	DOCUMENT CONVERSION
⚫	🔴 🟢	⚫	🔴 🟢	🔴 🟢	🔴 🟢	🔴 🟢	🔴 🟢	84	None	Yes
⚫	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟢 🔵 🟣	84, 88	1993 (elements)	No
🔴 🟢	🔴 🟢 🟣	🟡	🔴 🟢 🟣	🔴 🟢 🟣	🟡	🟡	🔴 🟢 🔵 🟣	84, 88	1993 (elements)	Yes
🟡	🔴 🟢 🟣	🟡	🟡	🔴 🟢 🟣	🟡	🟡	🔴 🟢 🟣	84, 88	1993 (elements)	Yes
🟡	🟡	🔴 🟢 🟣	🟡	🟡	🔴 🟢	🔴 🟣 88	⚫	84, 88, 92	1993 (elements)	No
🟡	🟡	🟡	🟡	🟡	🔴 🟢 🟣	🟡	🔴	🟡 84,88	None	Yes
🟡	🟣	🟣	🟣	🟢 🟣	🟣	🟡	🟡	84, 88	1988	No
🔴 🟢	🔴 🟢 🟣	🔴 🟢 🟣	🔴	🔴 🟢 🟣	🔴 🟢 🟣	🔴 🟣	🔴 🟣	84, 88	None	Yes
⚫	⚫	⚫	⚫	⚫	⚫	⚫	🔴	84, 88	1988	No
🟡	🔴	🔴 🟣	🔴 🟢	🔴 🟢 🟣	🔴	🔴	🔴	No	None	No

🔵 SMTP interface supports MIME 🟣 Offers tunnelling between like e-mail systems 84, 88, 92 = Conforms to the 1984, '88 or '92 X.400 specifications

The complexity goes beyond the number of gateways involved. As the number of standalone gateways increases, the chances increase that no one vendor will be able to supply all the connections, which means users will have to mix and match solutions from different vendors. The most likely result will be a network hodgepodge with different levels of integration between e-mail systems and different management tools needed to keep the gateways running.

Although many e-mail integration vendors got into the game by offering standalone gateways, many are turning their attention to more comprehensive products. Of the vendors responding to the RFI, Isocor, Novell, Retix, and Worldtalk say they still offer standalone gateways. Standalone gateways also are available from a variety of vendors that do not offer other e-mail integration products.

The main alternative to the standalone gateway is a product that essentially works like a gateway hub to connect multiple e-mail systems. This product type, which can be called a multigateway switch, handles protocol conversions, directory synchronisation, gateway management, and address and document translation among all connected e-mail products. E-mail systems are connected to the switch via individual gateway modules; only one gateway connection is required for each system at a given location, thereby reducing the number of gateways needed compared with the standalone gateway approach.

Multigateway switches can run on a range of platforms (from some PCs and workstations up to mainframes) and are available for a wide variety of operating systems and environments. Campus-type networks in which buildings or departments are running their own e-mail systems can be connected by a single central multigateway switch. Central switches are available from Alisa Systems, Isocor and Soft-Switch.

The third gateway type, the distributed multigateway switch, is a logical extension of the central switch. Distributed multigateway switches are networks of individual central switches linked via a directory and message transport backbone. Most of these use X.400 or SMTP as backbone message protocol and X.500 or SQL (Structured Query Language) for directory protocols.

Distributed multigateway switches are best suited to handling the geographically distributed, mixed e-mail environments typical of most large enterprise networks. They also are the most expensive integration products available. For big organisations with a variety of e-mail platforms, however, the distributed approach may be the only way to go for cost-effective, manageable e-mail integration.

Most vendors offering multigateway products are moving toward the distributed approach. RFI respondents with distributed gateway offerings include AT&T Global Information Solutions, HP, Soft-Switch, DEC and Worldtalk. Note that distributed products also can be configured to work as single-site gateway hubs.

Backbone Options

For distributed multigateway switches to work, they need robust backbone software to connect them. This software must provide the message and directory transport mechanisms that enable the switches to communicate with one another. Backbone software typically uses SMTP or X.400 to shunt messages between multigateway switches. One exception to this is Novell's backbone, which uses the vendor's MHS technology for transport services. Most products also conform to the X.500 standard for directory services.

A number of vendors offer transport and directory backbone technology that may be used to interconnect generic gateways, systems, and switches. These suppliers include AT&T Global Information Solutions, Control Data, DEC, HP, and Novell. Other companies that sell transport backbone software include Isocor, Novell, Retix, and the Wollongong Group.

One differentiator among transport backbone products is the X.400 versions on which they are based. The original X.400 standard dates back to 1984; since then the ITU-T has updated its standard twice, in 1988 and 1992. The feature sets of the 1988 and 1992 versions are much than the original standard, especially regarding X.400's ability to handle multipart, binary files in a single message. Products that conform to the later standards are better equipped to handle most types of files sent via e-mail.

X.500 or some other directory mechanism, such as SQL, is absolutely essential for implementing the address translation, document conversion, and sophisticated message routing needed for large-scale e-mail integration efforts. X.500 is likely to serve as the basis for 'Yellow Pages' directory services around the world.

Support for X.500 directory services is less consistent than X.400 support among vendors, but only because X.500 is a relatively new standard set. The first X.500 version was approved by the ITU-T in 1988; the 1993 update is just now being published. Although several vendors have extended their 1988 implementations to include critical features in the 1993 update, fully conformant products aren't expected until the end of this year.

A final e-mail integration product category — and one that is taking on increasing importance for large-scale networks — includes offerings based on the ITU-T Message Store specification. Message Store extends the management benefits of message and directory transport standards beyond the backbone to the individual e-mail systems. It does this by creating a product-independent 'post-office' service for all e-mail users.

The Message Store post office replaces the individual post offices used by different e-mail systems. With Message Store, differences among e-mail systems end at the user interface. Having only one post-office type within an enterprise network helps ease the management burden and makes post offices more accessible to end-users.

Although Message Store is in the formative stages, several transport backbone vendors already have added it to their support list, a clear sign that Message Store will become an important e-mail integration component.

The accompanying table offers a detailed breakdown of the features offered by each e-mail integration vendor regarding specific e-mail packages. The feature list includes directory synchronisation, tunnelling, the ability to handle binary as well as text files, compliance with the MIME (multipurpose Internet mail extensions) specification, integration via third-party products, and the ability to handle document conversion.

Directory synchronisation is the basis for implementing transparent user addresses between systems — in other words, it's an absolute requirement for integration. With this feature, for example, a user of HP's Desk Manager addresses a message to a user of WordPerfect Office with Desk Manager's addressing format; the integration software's directory software helps translate the address to the WordPerfect Office format. It also updates all proprietary directories so that addresses of users on other systems are readable by each system.

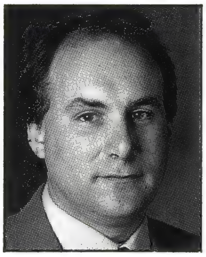
Tunnelling enables same-type e-mail systems located at different sites to exchange messages without going through translations by multigateway switches. When many multigateway products receive an e-mail file, they automatically convert that file to a neutral format before reconverting it to the format required by the target system. Without tunnelling, for instance, a cc:Mail user at Site B would be converted to a neutral format and then converted back to the cc:Mail format. Tunnelling eliminates this unnecessary step.

In the early days of e-mail, messages almost exclusively were short text items. Now that e-mail is used to send all manner of files integration packages must be able to handle binary file types as well as simple text. A few vendors have extended their binary support to include MIME, a new standard that pertains specifically to Internet mail exchanges.

Rather than develop their own solutions for integrating certain e-mail packages, some vendors rely on third parties for links

Continued on page 46

LAN VIEWS



Compression and Compromise

Graeme Le Roux

The concept of data compression is not new, nor even uncommon; however many more vendors of equipment aimed at the network market are featuring it in their products these days. Nor is compression restricted to data; many wide area networking products also provide compressed voice channels. The industry's marketing machines naturally have been pushing compression as the best thing since binary code but many a network administrator has found that the data compression features of many products have pitfalls. So how do you assess the benefits of data (or voice) compression for a given system? First of all it is important to understand what all compression algorithms are actually doing.

All compression algorithms are based on the premise that a significant proportion of the data to be compressed is repetitive. Compression algorithms are designed to remove or reduce this repetitive data, thereby significantly reducing the overall amount of data. The information removed is replaced by some form of structural information which is used by a corresponding decompression algorithm to generate and replace the original data. For example, the file which makes up this column is, disregarding character format and page layout, simple ASCII text. That means that only seven bits are used per character so, by the simple and very quick expedient of removing these superfluous bits, the file's length could be reduced by about 12%. A better algorithm would be to make use of the fact that in most languages words share common character strings. In English such things as 'ea,' 'the,' ' the ' (note the spaces), 'en' and 'ere' are common examples. By parsing this text for repetitive character strings of two to five characters in length (some of which might be combinations of shorter repetitive strings), bracketing the first instance of each string with a token (i.e. a non-ASCII character) and then simply replacing all following occurrences of the string with that token you might be able to reduce the length of this text by more then 50%. The catches with this more sophisticated algorithm are that it takes time to parse the text, it only works for straight text and if the first or second instance of a token is corrupted in transmission then the entire file will be corrupted during decompression.

> *"Devices such as modems, bridges and routers which can compress data have their applications . . . [but they cannot] . . . match the consistent throughput rates of uncompressed data links."*

The efficiency of this algorithm is also related to the original length of the piece and the way it is written. I can only have 128 tokens therefore it would be best to use them for the strings which will save the most characters. The longer the text the more instances of any given string will exist and if the text is written in an informal manner it will contain a number of stock phases, idioms and colloquialisms which might repeat. This increases the efficiency of the algorithm.

However if you consider this page as a bit map then the algorithm above is a waste of time since the entire page, including the picture, is just black and white dots. Each dot, depending on the file format you're using, will be represented by between one and 24 bits (sometimes more). These bits will form simple patterns and by carefully defining the structure of the compressed file you can generate a list of tokens at the head of the file and then reduce the file to a list of records containing token, length and offset fields thus reducing, for example, the large chunks of white space on the page to a single token record attached to a two dimensional array of offset-length pairs. Notice that, once again, the loss or corruption of the first instance of any token would result in the entire file being scrambled.

There are many variations on the token offset theme and the smarter compression utilities will spend substantial time analysing a file set and using different algorithms to achieve maximum compression ratios. Unfortunately a modem, router or disk handler does not have the luxury of time to parse a data stream nor does it have an entire file or file set to work on. Such devices receive arbitrary bit streams which may be data of some sort, executable code or even compressed files and they receive it in buffer sized chunks which they must compress on the fly.

There are several ways around this problem, all of which assume that in most cases a link between two such devices will carry traffic of a reasonably consistent type — for example, all e-mail or SQL queries — and therefore there will be a significant number of bit patterns which will repeat over one or more buffers full of data. This being the case one modem, say, can generate a series of tokens on the basis of a buffer of data, then transmit them to the modem at the other end of the link and then apply them to the current buffer of data and any future buffers. Both modems then end up transmitting largely tokens rather than unprocessed data. Tokens are aged on the basis of use in much the same way that a bridge ages MAC layer addresses. The penalty is that your modem has to have as large a buffer as possible for both tokens and data, a very fast CPU to execute a non-trivial parsing algorithm which has to be stored in a large amount of ROM and has to be talking to a modem which has the same revision of the same algorithm on the other end of a clean line (any data corruption will result in an entire buffer having to be retransmitted). Both modems also have to have a sophisticated error checking algorithm — especially for passing tokens — which is generally a CRC based on an industrial grade polynomial expression.

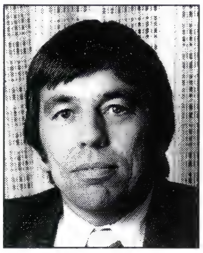
In summary, devices such as modems, bridges and routers which can compress data have their applications, particularly in file transfer; however they are not capable of the high compression ratios which specialist software can achieve nor can they match the consistent throughput rates of uncompressed data links. For example a V.fast modem may be capable, under ideal line conditions and with ideal data, of exceeding the throughput of an aggregated pair of ISDN D channels, but it will not give you an honest 128Kbps at all times.

Furthermore, such devices are proprietary and therefore prohibit you from using your modem's compression mode for general communications — unless everyone you call has the same modem. Nor can you use your non-standard data compression feature to access services such as Austpac. In short, look at devices offering compression in the light of your specific needs. If such devices, with their limitations, meet your needs fine, if not, file the marketing blurb under recycling.

Graeme Le Roux is a Director of Moresdawn Pty Ltd (Bundanoon, NSW) and specialises in local area network consulting services.

OPEN SYSTEMS

Should TCP/IP Join in the GOSIP?



Alan Lloyd

The US Government is now considering TCP/IP and the complete Internet Protocol Suite (IPS) as part of its Government Open Systems Interconnection Profile (GOSIP). Earlier this year, the Systems and Network Architecture Division of The National Institute of Standards and Technology (NIST) provided a draft report for comment. Naturally the report favours the inclusion of the IPS, and no doubt such consideration will be given by other US Government departments responsible for GOSIP. OSI is a framework for standards and as such, new standards will be included as technologies develop and obsolete standards are retired. Note that nothing forbids the use of TCP/IP and IPS in GOSIP. It is really a case of government agency policy and how such a policy is implemented. While I appreciate the need for pragmatic approaches to the use of technology, such as the implementation of TCP/IP (IPS) and proprietary protocols, and the need for interworking, a wrong decision at this level would have serious ramifications for any government's large scale IT systems.

The TCP/IP base has expanded because it has grown on the basis of selling cheap simple LAN-type products with an image of 'global inter-connectivity.' But the reality is quite different. TCP/IP is still useful, is cheap and provides a service in specific networking environments. However, one cannot build a complex global network with a simple protocol such as TCP/IP. One can only build a network that is connected globally.

IPS at the IP level has a fundamental weakness in its addressing scheme. (IP is similar to ISO's CLNP except for its addressing scheme.) The IP 'address' is *not* an address. It is a limited length, randomly allocated number.

It is physically and operationally impossible to build a global network using randomly allocated numbers for addresses. The route update traffic and the network's operational costs alone would limit such a network. That is why the carriers use structured addressing schemes in their global networks.

The IPS at the messaging level has another major weakness — its lack of message transfer integrity. There are no delivery reports or receipt notification elements in SMTP. SNMP will also come unstuck in large scale systems because it is 'addressed' using IP addresses. One cannot use 'simple things' to manage global networks. Just ask the carriers. The ISO/ITU-T designed global network protocols and X.700 (CMIS/P) to remove SNMP's deficiencies.

An OSI-compliant carrier network, such as a global telephone system, has taken over 80 years to get where it is, and is still being deployed! A global data network cannot be installed overnight. In order to achieve such a network, globally allocated addressing schemes (and the protocols that carry them) must be defined and used from the start. These addressing schemes are defined by ISO and ITU-T.

If government deploys a network that can internationally connect, be used for trade, banking, customs, police, health and taxation, etc. and interface to the private sector, the network should conform to international (carrier-based) standards and their addressing schemes. GOSIP specifies ISO/ITU-T protocols to carry globally specified addressing. *This is GOSIP's main strength.* GOSIP should not be seen as just the specification of 'other communications protocols.' It is the foundation of the government's naming and addressing scheme, networking, messaging and agency interworking.

Exploding OSI Fallacies

A common OSI complaint is that GOSIP products have been slow to market and are not deployed. GOSIP embraces physical interfaces (e.g. V.24), link protocols, X.25, 802.3, 4 and 5, ISDN, CLNP, X.400, etc. — a wide variety of widely deployed technologies which also support the IPS. X.25 has been deployed globally for over 15 years. LANs have been available for over 10 years.

Another fallacy is that the Internet and GOSIP network infrastructures are not comparable. Telecommunications carriers around the world operate huge networks and infrastructure. For example, the X.25 packet networks provide 'global' services to millions of users and there are now 200 X.400 ADMDs (carriers) interconnected, providing a commercially accepted global messaging system. The Internet is minor compared to these networks and is, in fact, supported by carrier networks. The carrier networks all conform to OSI/GOSIP standards (SDH, PDH, G.703/4, X.25, ISDN, X.400, etc.).

Critics say there is a lack of GOSIP products and they are too expensive. Actually, there is an abundance of OSI products. In any network product brochure there are usually more GOSIP standards supported than IPS standards and these OSI products have been available for years! With respect to product costs, LAN and X.400 products, for example, are falling dramatically in price and are much the same price as IPS products. However, you get what you pay for — cheap does not automatically mean good or that the product has a reasonable lifetime! The cost of operation, the product's limitations and its future must also be considered.

Another claim is that the widespread use of proprietary electronic mail makes OSI unnecessary. I am not alone in believing that the number of proprietary mail system suppliers will decline because the competition in this market area is too high to sustain such numbers. These e-mail suppliers are all adopting X.400 as an infrastructure, but are attempting to gain market share with new whiz-bang office automation features. Many commercial organisations just cannot accommodate this rate of change in short-lived office products, so they will refuse to purchase such things. I believe that a few suppliers will eventually emerge as the dominant user interface, gateway and X.400 core product suppliers. Note, too, that some of these products are already integrated and do run over TCP/IP and OSI transport/networking 'protocols.' For instance, Telecom provides electronic mail, fax, EDI and 'EDI-to-Postal' services via X.400. This means that large corporations will focus their office automation and messaging services on X.400 and should seriously consider the short lifetime of less popular and proprietary mail products.

What is Really Happening?

It is to be expected that the ISO and ITU-T has taken a few years to design global networking standards and recommendations, because hundreds of carriers will spend billions of dollars to deploy them right across the planet. They have to know that the technologies defined will scale, interwork and deliver service. The carriers do not believe in rapid prototyping at the global level. A 'trial and error' approach, or global network experimentation, is very costly and not in anyone's interest.

On the other hand, IPS has been deployed quickly, accompanied by uninformed statements that 'OSI takes too long' and IPS will dominate the world. In 'OSI's absence' the TCP/IP and PC end of the computer networking business has delivered some well-packaged connectivity tools which have been marketed as high volume 'global' products and sold in large numbers.

Now IPS is suffering from scaling issues (hence the work on its addressing scheme). And, in my opinion, this will not be the last major issue. Once this addressing issue is 'fixed,' the route management protocols will need fixing — as routing algorithms and protocols are totally related to how protocol address structures are used. Then the messaging protocols will need fixing to give some degree of service comparable to that of X.400. And finally the management system, SNMP, will need an overhaul.

What is the effect on a global network with millions of nodes that is evolving in this 'experimental' manner? More importantly, what is it doing for the equipment costs and the information and service reliability of the businesses using it? It is a case of 'fast and simple' versus 'slow and global.' An example is the SNMP versus CMIP management protocol issue.

Long Live CMIP

Most people believe CMIP is dead. SNMP has been upgraded to SNMP 2 and all is well. I disagree. SNMP uses IP and a four-byte IP address to get from the management station to the network node. In most cases this address is pre-configured. The User Datagram Protocol (UDP) address selects the SNMP port (application) within the network node. Above the IP and UDP level, the SNMP protocol, say a GET operation, carries an 'Object Identifier' (a string of numbers) to define the class and instance of the managed object with respect to the node; i.e. it accesses the attributes being requested by the manager. See, it is simple!

But note the way in which this 'global' managed object is accessed; i.e. by a sequence of an IP address, a UDP port, an Object Class Identifier and an extension number for the object's instance within the node.

CMIP on the other hand uses network protocols that carry internationally agreed global addressing schemes. The CMIP protocol itself carries a naming structure called a Distinguished Name (DN). This DN is the same form as used in the X.500 directory services (for Global Naming). This means that with OSI and CMIP, a managed object in a global network can be uniquely named e.g. AU (Australia), Telecom, Austpac, Melbourne, Node 3, X.25Entity, Circuit3, Packet Statistics — the object is globally named or identified. The managed object in the node is accessed by its manager, for example, by referencing the high order names components (i.e. AU (Australia), Telecom, Austpac, Melbourne, Node 3) via a directory system to obtain its NSAP address, which is then used by the network protocols to communicate with the node. The CMIP GET and its complete or partial DN are transferred to the node over the network and upper layer protocols. At the node the low order name components (i.e. Node 3, X.25Entity, Circuit3, Packet Statistics) are used within the node to reference the object's data.

> *"TCP/IP is still useful, is cheap and provides a service in specific networking environments. However, one cannot build a complex global network with a simple protocol such as TCP/IP. One can only build a network that is connected globally."*

In a global network, managed objects should be referenced by name and at the global, national, or company/network level. Also because the name form is compatible with X.500 directories, X.500 can be used to support the X.700 management systems. As systems grow to the global scale they will need directories. (The phone system and the X.400 messaging system all use directories because they are large scale systems.)

As the IPS and Internet scales up to millions of nodes with tens of millions of managed objects what will happen to SNMP? How will SNMP deal with the carriers' TMN architecture and X.700 functions, Intelligent Networking, Global Virtual Networking, Universal Personal Telecommunications, X.400 MHS Management, distributed directory systems, accounting, fault management, diagnostics and testing, security, and naming?

I was directly involved with the development of X.700 and the CMIP standards and know that the restrictions of SNMP were realised in the late '80s. The CMIP design process attempted to remove these. The global carrier networks of the future will be, in simple terms, the biggest and most complex distributed system ever built. Their management systems must have uniform global naming and addressing, which is provided by X.700, X.500 and NSAP standards.

I find it interesting that the Distributed Management Environment (DME) has been dropped, probably because the same 'simple' philosophy as used with SNMP has been found wanting. The idea was to make a generic API/service that represented management operations (SET, GET and ACTION, etc.) and that would provide the world with management. It really isn't as simple as that. Perhaps SNMP and PC technologies are best left to manage the LANs.

Basic GOSIP Questions

GOSIP is a profile supported by an implementation policy. It should direct IT procurement with the aim of producing medium to long term IT systems and operational consistency. A free-for-all policy allowing 'popular' technology will fail, and high costs and risks will result. GOSIP must remain ISO/ITU-based because it is directed at IT foundations and infrastructure. If other interested groups wish to develop global standards, all they have to do is join the ISO or ITU.

I believe before we consider the inclusion of IPS and other technologies into GOSIP, some basic questions must be asked.

Why would a government include in its IT policy a network protocol set that has a limited address form and will not scale; or a messaging system protocol that has no message transfer integrity, particularly when the world is moving to X.400 message-based systems? How will a government operate with a concoction of naming and addressing schemes throughout its distributed IT systems? What will it cost to administer such duplicated schemes? It will probably cost much more than the savings from buying de facto/proprietary instead of ISO CLNP (NSAP) and GOSIP-based products. What do you do with two million network nodes with the wrong addressing scheme (and protocols) and management architecture installed?

Why is the IPS being recommended for inclusion into GOSIP? Why does the Internet community seem to ignore the addressing/scaling and integrity weaknesses in the IPS and recognise that these problems have been fixed by ISO and ITU-T standards? What are the IPS concepts with respect to operating and administering large scale business networks? If IP is not fixed by moving to CLNP and ISO NSAPs, will the result be global IT chaos with two disparate addressing and routing schemes? If IPS customers experience these infrastructure problems, will they then be forced to change to GOSIP?

Why do we all insist on a phone system that can, through its international addressing scheme (its numbering plan), connect to the world, yet with a data network — an information infrastructure — try to enforce a 'funny numbers' approach?

The issue of multiprotocol sets is one of pragmatism. But this pragmatism is not one of product availability and cost at the expense of IT chaos. It is one concerning the longer term costs of running integrated large scale distributed IT systems. This will only be achieved by insisting that those who oppose GOSIP realise that it defines internationally administered addressing schemes and globally standardised naming, networking, routing, messaging and management functions which are all supported by the world's carriers. These elements are essential for large scale government networks.

I am not saying that TCP/IP or the IPS should not be used in localised networking environments. A naming and addressing policy that maps IP and SNA addresses onto the lower parts of NSAPs will provide an understanding of the network design issues and the way in which integration and migration from TCP/IP and SNA to a GOSIP core network should occur. However, what one must avoid is walking into network problems with two million nodes installed.

Unfortunately, the success of the Internet as an information service is being used to support a misguided and totally wrong view about the supposed failure of OSI. Knowing that there are these major weaknesses in the Internet's technologies, and that they are having to be resolved by using ISO and ITU-T standards, why is the IPS being forced into the US Government's IT policy? We do not want duplicated, overlaid networks and confusion in our IT systems or the wasted cost in sorting out the potential (global) mess.

I hope that the Australian Government maintains its current position with regard to GOSIP and that we in Australia take advantage of being able to deliver large scale (globally ready) GOSIP-compliant business IT systems that easily interconnect with the emerging global carrier services and intelligent networks. Australia's GOSIP and its implementation will then give us the global opportunities we need.

Alan Lloyd is Strategic Developments Manager for Datacraft Australia Ltd (Melbourne, VIC).

Technology Update

At Last, a Blueprint for Wireless LANs

Wireless LAN implementation may get a boost now that the IEEE 802.11 committee has finally agreed on a spec for wireless media access control (MAC). The spec governs LAN access using the CSMA/CA (carrier-sense multiple access with collision avoidance) protocol, and will work with a range of wireless technologies including spread spectrum radio, narrowband radio and infrared, and provide for both time-sensitive traffic and asynchronous data. It will support two types of wireless architectures — peer-to-peer LANs, such as an ad hoc group of PCs brought to a meeting, and infrastructure LANs, which connect multiple wireless systems to a hard-wired backbone. A draft version of the spec is expected by mid-year. Lack of standards for wireless networks has long been blamed for hindering uptake of the technology by users.

Extending Full Duplex Beyond Ethernet

Full duplex, a technology originally developed to enable Ethernet networks to operate at double speed, has caught the eye of vendors of switched Token Ring and FDDI equipment, who see the technology as a way to boost the throughput capabilities of their products. The IEEE is shortly expected to approve a draft version of a full-duplex Token Ring spec, which will allow traffic to travel at 32Mbps between Token Ring switches and nodes. The principle behind full-duplex is the same for Ethernet, Token Ring or FDDI switches — the access control mechanism is disabled, permitting data to flow in both directions at once. Both 3Com and Cabletron are reported to be working on full-duplex products; 3Com on a 100Mbps fast Ethernet switch, and Cabletron on full-duplex FDDI capabilities for its MMACplus hub.

AT&T Releases 100Mbps Fibre Channel Chips

AT&T Microelectronics has begun to offer samples of a pair of silicon integrated circuits which conform to the Fibre Channel physical interface layer for 100Mbps data transfer. The new ATT DA204 and DA205 transceiver set uses less than five watts of power when operating on a single 5V supply, according to company officials, who said it was the first lower-priced chip to match the power dissipation of Gallium Arsenide devices. A version of the chip set which consumes only 3.2 watts is scheduled to commence a sampling program later this year.

Wireless E-Mail System

A small Australian startup, Sydney-based Blue Sky Communications, has joined with BellSouth Mobile Data Australia to offer a wireless electronic mail service for users of Microsoft Mail Remote. The service uses a wireless modem and specially developed software to connect to BellSouth's digital packet-switched network, and allows users to send electronic mail from anywhere within BellSouth's established network (currently covering most of metropolitan Sydney and Melbourne) without the need for a phone socket. A Blue Sky spokesperson said the company is working on drivers to allow all other major e-mail packages to communicate over the BellSouth network.

Novell, AT&T Develop PABX/LAN Software

Novell and AT&T's new PBX/LAN software interface, Telephony Services for NetWare, is generating interest in both the computing and telecommunications spheres. Some 24 developers of telephony products have reportedly joined Novell/AT&T's Telephony Services Early Implementors Program to develop applications to work with the new interface, and eight PABX vendors have announced plans to implement software links integrating their equipment with the software.Telephony Services for NetWare enables many complex PABX functions to be handled by applications running on PCs attached to both the PABX and to a LAN.

E-Mail from page 42

to those packages. The level of functionality offered by third-party software generally is the same as that provided by the integration vendor for other e-mail systems.

With document conversion, application files sent between e-mail systems are converted at the gateway to the format required by the recipient. For instance, if a word processing document created with WordPerfect is sent to a user running Microsoft Word, the document conversion utility handles the format conversion.

All the products listed comply with the RFC 1006 specification, which is intended to ensure that OSI applications run over the Internet's TCP/IP backbone. RFC 1006 specifies the interaction between OSI Layer 5 (the session layer) and TCP/IP, which operates at Layers 3 and 4 of the OSI protocol stack. Since most corporations are using TCP/IP and OSI, this feature is necessary to allow independence of X.400 and X.500 from the underlying protocol stack.

Looking Ahead

Although some e-mail integration products have been available for some time, these offerings are likely to undergo significant change in the coming months. This is especially the case regarding new or emerging standards, like the 1993 X.500 update, MIME, and RFC 1006. For managers facing large-scale integration efforts, the biggest advances are likely to come with products implementing Message Store, which will help simplify e-mail management by eliminating the need for system-specific post offices.

Competition among e-mail integration vendors is heating up. The very large integrators, including early market leaders like DEC, HP, and Soft-Switch, now face some stiff challenges from companies like AT&T Global Information Solutions. For large and midrange integration, it looks likely that vendors will stoke the competitive fires even more, resulting in lower prices and higher performance — a combination that's always welcomed in net management circles.

Rik Drummond

Who’d have thought?

He ain'
He's my

DECbrouter 90T2
AIR MAIL
To: COMALC
HANDLEY DRIVE
BOYNE ISLAND
QUEENSLAND 47
Attn: John Steindl
From:
MINENCO PTY LIMITED
INFORMATION TECHNOLOGY SERVICES
111 Coventry Street, South Melbourne
Tel (03) 695 4444 Telex AA31580
Fax International 61 3 695 4211
MINENCO

Digital's bridging router: The DECbrouter 90

John Bevins DG01205-2L

t heavy. brouter.

Who'd have thought that connecting remote Ethernet LANs doesn't have to be a heavy technical exercise? That easy, out-of-the-box installation can be handled by anyone at the remote site? With a minimum of instructions and no technical know-how.

And who'd have thought that this same bridge/router can also be configured to use the most sophisticated routing features available to you today?

Jointly developed by Digital and CISCO, the DECbrouter supports a full range of networking protocols, at clock speeds of up to 2Mbps.

Oh, and who'd have thought that a brouter can be so light and so easy to handle...and not with kid gloves, or even anti-static gloves.

Call Digital on 008 021 393 for more information, including a free copy of the Digital white paper on routing protocols.

Digital's DECbrouter. Who'd have thought?

Who'd have thought?

digital®

® The "digital" logo and DECbrouter are registered trademarks of Digital Equipment Corporation.

John Bevins DG01205-3R

INS Product Leaders

TEST INSTRUMENTATION • NETWORK MANAGEMENT SYSTEMS

LAN/WAN ANALYSER

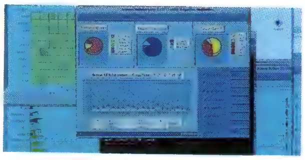
LAN: Token Ring
ETHERNET

WAN: ISDN
FASTPAC
AUSTPAC
TRANSEND
DDN
SNA

PROTOCOLS:

X.25, SNA, HDLC, SDLC, SS7, Q921/Q931, XNS, TCP/IP, NETBIOS, NETBUI, ISO, APPLETALK, MBI, DECNET, SUNNFS, X-WINDOWS, SNMP.

CENTRALISED LAN MANAGEMENT-RMON



- Full RMON MIB.
- Graphical Interface.
- Total Network Management across entire network.
- Seven - Layer decodes for all major protocols.

PC-BASED BERT

- Turn your PC into high speed BERT.
- Support RS232, V.35, X21, G703, G704.
- G821 analysis with histogram and capture to disk.
- G704 monitor tool.

NOTEBOOK BASED WAN ANALYSER

- Full Duplex to 2MBPS.
- E1 and Fractional E1.
- SNA, X.25, ISDN.
- Frame Relay, SMDS.
- Dual Channel.
- Graphical Interface.

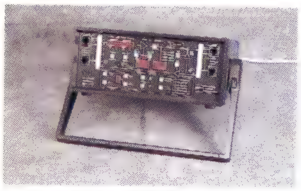
NETWORK PROBE

- Multi-function analyser.
- Built-in interfaces for RS232, X.21, V.35, ISDN.
- Multiple protocols support.
- Light weight/low cost.
- AC/DC operated.

TDR/LAN SCANNER

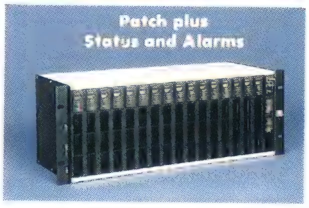
- TDR and cable scanning for UTP, STP, Coax, IBM cabling, up to 100MBPS.
- Measures NEXT, length, ATTENUATION, Resistance, continuity, LAN monitor.
- Optional cable management and cable grading software.

SIMULATORS



- Most major Telephone network types.
- DDS, ISDN links.
- DDS, ISDN cables.
- Multiple cable gauges, length and speed up to 34.8MBPS.

DATA PATCH/ SWITCH SYSTEMS



- Circuit switching and PATCHING.
- RS232, V.35, X.21, G703 etc.
- Transparent to protocol.
- Full remote or local control.

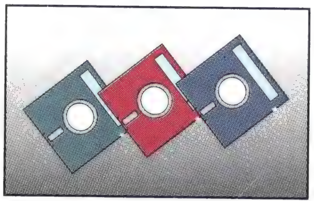
PC-BASED PROTOCOL ANALYSER

- Turn PC into full function protocol analyser.
- Half size card supporting major protocols, interfaces.
- Speed up to 2MBPS.

LIGHT SOURCE/OTDR/ POWER METER

- Fiberoptic test equipment for LAN, WAN, FDDI.
- PC-based and hand-held.
- Power attenuation, dual wave length test systems, LED or Laser sources, Talk sets.

SOFTWARE



- LAN management software for Ethernet, Token Ring, ARCNET and Appletalk.
- Comprehensive statistics and protocol decodes.
- Low, low, cost!

Please send me more information on:

☐ TDR/LAN SCANNER
☐ NETWORK PROBE
☐ FIBEROPTIC TEST EQUIPMENT
☐ LAN MANAGEMENT - RMON
☐ LAN/WAN ANALYSER
☐ PC-BASED BERT
☐ SIMULATOR
☐ SOFTWARE
☐ WAN ANALYSER
☐ DATA PATCH/SWITCH SYSTEM
☐ PC-BASED PROTOCOL ANALYSER
☐ OTHERS

NAME: ______________________
ADDRESS: ______________________
ORGANISATION: ______________________
PHONE: ______________________

INS

INFORMATION NETWORK SOLUTIONS PTY LTD
Unit 3a, 3 Lanceley Place Artarmon, NSW, 2064
Phone (02) 906 - 6335 (03) 653 - 9480 Fax (02) 906 - 6327

Segue Into Switched Networking

Cabletron's MMACplus hub offers a migration path from shared-access LANs to high-speed switched connections.

Network managers are always on the lookout for ways to migrate from present-day to next-generation technology without having to toss costly equipment onto the scrap heap and start from scratch. Cabletron is doing its part to prevent networking gear from becoming landfill. Its MMACplus hub will allow users to smoothly cross over from shared-access LANs to higher-performance switched networking — without a change of hardware.

The MMACplus can accommodate shared-access and switched versions of Ethernet, Token Ring and FDDI and supports interfaces to ATM networks. Users configure the hub by sliding interface modules into the 14-slot chassis; each takes one slot.

The MMACplus' ability to juggle two types of networks isn't the only thing that sets it apart from rival hubs. Every interface module contains an SNMP agent and has the intelligence to perform bridging, routing, and call setup.

The module's self-reliance brings users some significant benefits. They will be spared the cost of separate bridge and router cards, plus, there is no single point of failure; a faulty card only affects the devices connected to it. Management is streamlined, as the box oversees both shared-media and switched connections.

The hub contains two separate buses, one geared to shared-access LANs and the other to switched connections (see the figure). The Flexible Network Bus (FNB) comprises two redundant 100Mbps FDDI rings for shuttling data between shared LAN segments. (By utilising the second, redundant ring in each FDDI, bus throughput can be boosted to 400Mbps.)

The Internal Network Bus (INB) uses time-division multiplexing to supply an aggregate 4Gbps of non-blocking throughput to switched connections. A statistical mux feature, included as standard, can be used to increase available throughput to a maximum of 10Gbps by automatically re-allocating unused bus capacity to modules.

Cabletron sells a range of interface modules for each type of LAN connection. For the FNB, versions are available supporting 24 or 36 10Base-T Ethernet ports over UTP cabling, 24 Token Ring ports over UTP or STP, 24 or 36 10Base-FL Ethernet ports over fibre, or eight FDDI ports. There is also a 12-port FDDI concentrator that can use either STP or UTP cabling and a repeater module that dual-attaches the FNB to an FDDI backbone. Also available is an ATM interface module, providing one uplink connection to an ATM network.

Each INB interface module contains an autonomous LAN switch in the form of a Cabletron Securefast Packet Switch (SFPS) ASIC (application-specific integrated circuit). According to Cabletron, each ASIC forwards 400,000 packets per second (pps), with an aggregate rate of more than 5.6 million pps in a fully loaded chassis. Set up solely for switching, the MMACplus supports 168 dedicated Ethernet or Token Ring connections or 28 FDDI links, or a mix.

Modules available for the INB include a 12-port Token Ring switch that uses either STP, UTP, or fibre; a 12-port Ethernet switch that works with either UTP or fibre; and an ATM uplink interface. Switched connections run at the full speed of the LAN.

Cabletron says that Ethernet throughput can be doubled to 20Mbps by enabling a full-duplex Ethernet feature, so that traffic can flow in both directions over switched connections. The company also sells a 2-port FDDI switch that connects the INB as a dual-attached station (DAS) to one or two external FDDI rings.

Cabletron says WAN interfaces will be available later this year, and a full-fledged ATM switch module is also in the pipeline.

PRODUCT SUMMARY

Name: MMACplus hub

Description: Modular hub able to handle both shared-access LANs and dedicated switched connections

Price: Pricing for shared access per port for Ethernet, Token Ring or FDDI is available on application to Cabletron Systems

Vendor: Cabletron Systems, Unit 8, 25 Frenchs Forest Rd, Frenchs Forest NSW 2086 Tel: (02) 950 5900

Transmission Techniques

Interface modules forward traffic across the buses one of three ways: routing (IP, IPX, AppleTalk, and DECnet Phase IV protocols), MAC-layer bridging, or setting up a link using the Connection Services spec defined by the ATM Forum. Managers designate which technique each module will use during system setup.

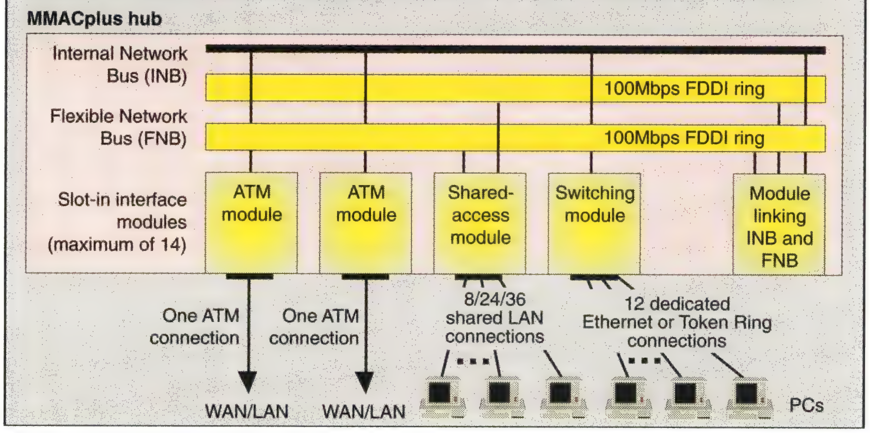
Both buses are able to exchange packets from dissimilar LANs. The INB interface modules convert all traffic into a proprietary 56-byte cell format for bus transport; it's reconverted to the appropriate format when it reaches its destination. The FNB converts all traffic into FDDI frames for transport across the bus.

Each module contains an SNMP agent with RMON MIB. When setting up the hub, managers select one module to act as the master unit. Its task is to collect statistics from other SNMP agents and pass them to the management console. Users can gather information out of band via a 10Mbps dedicated management bus inside the chassis.

Stephen Saunders

One Box, Many Connections

The 14-slot MMACplus hub contains two separate buses. The Flexible Network Bus (FNB), for shared-access LANs, comprises two redundant 100Mbps FDDI rings. The Internal Network Bus (INB) supplies an aggregate 4Gbps of throughput to switched connections.


MMACplus hub
Internal Network Bus (INB)
100Mbps FDDI ring
Flexible Network Bus (FNB)
100Mbps FDDI ring
Slot-in interface modules (maximum of 14)
ATM module
ATM module
Shared-access module
Switching module
Module linking INB and FNB
One ATM connection
One ATM connection
8/24/36 shared LAN connections
12 dedicated Ethernet or Token Ring connections
WAN/LAN
WAN/LAN
PCs

Chipcom's Unkillable Hub

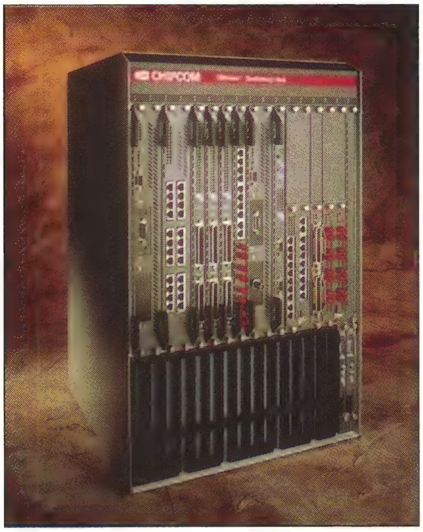
Chipcom's new ONcore hub and modules are designed to be practically unstoppable.

In 1990 Chipcom released its ONLine family of chassis-based hubs. The target market for ONLine comprised companies with sites in which a network could not be allowed to become unavailable for any reason, at any time.

ONLine's continued strong sales are a testament to the fact that Chipcom has met this market's needs very well. However, the last three years have seen networks become so important to many of Chipcom's customers that an even more reliable and higher performance hub was required to supplement the ONLine family, so Chipcom gave its engineers a frighteningly simple set of basic design goals: design a cost effective hub which is fully compatible with all existing ONLine components, which exceeds ONLine's performance significantly, which will support all current and emerging technologies, and which need never be shutdown for any reason. The ONCore family is the result.

As with the ONLine range, the basis of the ONCore family of products is a 17-slot chassis which includes a power supply and controller. The controller, which is responsible for power management, occupies a dedicated slot, while a second dedicated slot is available for a redundant controller module. The two controller slots are in addition to the unit's 17 'payload' slots.

The ONCore chassis is physically larger than its stablemate and incorporates a backplane architecture which is a high performance superset of the ONLine TriChannel architecture. ONLine modules are simply fitted with an adaptor kit which allows them to be mounted in ONCore's physically larger slots. No add-on electronics are required and all ONLine features are supported — however the ONCore's more advanced features such as the automatic identification feature of ONCore modules are not supported.



An ONCore hub can detect the insertion or removal of an ONLine module, however an ONCore module can be identified and basic parameters like power requirements and priority read from the module. If insufficient power is available for a new module, then that module will not be activated and the controller will signal a resident network management module to send a trap message to the network management console.

Network management is via Chipcom's existing ONDemand software which runs under HP OpenView or Windows.

ONCore hubs allow users to define the relative operational priority of each module. In the event that a failure in one of the hub's load sharing power supplies results in insufficient power being available to maintain full function, low priority modules can be shut down by the controller and the hub can be automatically re-configured to ensure that critical functions are preserved.

Up to four 295-watt load sharing power supplies can be installed in an ONCore chassis. All power supplies, controllers and fans can be replaced while the unit is in full operation, making the hub just about unkillable. The only ONLine module not supported by the ONCore chassis is the ONLine Controller module.

The ONCore chassis has a backplane architecture which can support up to eight Ethernets, 17 Token Rings and eight FDDI Rings, and which is designed to be fully field upgradable. The aggregate bandwidth currently available is 5Gbps. Later this year Chipcom will release an 8Gbps switching backplane which users will be able to install into operational units. This switching backplane will support both packet and cell switching, providing the initial hub-based platform for Chipcom's support of ATM. Future upgrades will be end-user installable.

As is the case with the ONLine range, all ONCore modules are self contained and can continue to function without intervention by a management module. This means that the catastrophic failure of a management module will not affect users. ONCore's management functions are distributed in the architecture. A Distributed Management Module (DMM) is installed in a single slot, and daughter boards for Ethernet (the only one available at the time of writing), Token Ring, FDDI, and so on are added as required. Redundant DMMs may be installed.

PRODUCT SUMMARY

Name: Chipcom's ONCore hub family

Description: Ultra-high reliability chassis-based hub with advanced management and switching capabilities. Supports Ethernet, Token Ring and FDDI, and is 'ATM-ready'

Price: 17-Slot Hub with Power Supply and Controller $11,760; Load-Sharing 295-watt Power Supply $1,515;Fault-Tolerant Controller Module $3,360; 24-Port 10Base-T Module $8,565; 10-Port 10Base-FB Module $8,910; Distributed Management Module $6,210; Ethernet Network Monitor Card $2,520 (All prices are RRP excluding tax)

Vendor: Chipcom International Inc.

Distributor: INC Manufacturing Pty Ltd Block R, Unit 2, 391 Park Road, Regents Park, NSW Tel: (02) 645 2200

At the time of writing only a 24-Port 10Base-T Ethernet Module and a 10-Port 10Base-FB Ethernet Module were available, however Chipcom plans rapid release of Token Ring modules. All port modules support a range of extremely flexible configurations like 'isolated networks' (groups of ports which are configured as small workgroup LANs on a single module without access to the hub's backplane), port switching, as in the ONLine family, and later, packet switching. Modules also have provision for a security daughter card that can monitor and prevent eavesdropping and intrusion.

As with the ONLine family, the ONCore products are intended to be deployed as a high reliability transmission system which dynamically — and automatically — reconfigures itself in response to network traffic and user defined conditions to provide totally dynamic bandwidth on demand. The features which help the module achieve this also provide network designers with an unmatched foundation for the design of fault tolerant and self-healing systems.

Chipcom actively encourages its customers to use dynamic configuration changes as part of normal operations, making it an attractive proposition for the cost-conscious customer.

Graeme Le Roux

ADC Fibermux Snaps Up LANs

New stackable hubs are a 'snap' to put together and support mixed Ethernet and Token Ring LANs.

The 'stackable' hub, which is now well and truly into the commodity category of network equipment along with adaptor cards, has drastically simplified the mechanics of scaling a network. If you want more ports or a dozen ports of a different type, just plug another module into the stack. If you want to increase the bandwidth of your backbone, just plug each stack into an individual port on a central chassis-based hub, and if you want to bridge or route between stacks just put the bridges or routers into the central hub.

All very neat, but there are a few irritating rough edges, like the daisy chain of cables linking modules in the stack, the power cables going to each module and the inevitable plug board, which in turn goes into a mains socket. Such a tangle is both unsightly and potentially unreliable.

There is also the issue of a small to mid-size remote office, where a router is required as well as a stackable hub. Such offices are often too small to have a full time administrator, so someone from head office has to go out and put the whole lot together, costing both time and money. ADC Telecommunications has gone a long way towards eliminating the rough edges of stackable technology by developing the SnapLAN family of 'Snappable' hub modules (somebody at ADC definitely has a sense of humour . . .).

Basically, each SnapLAN module consists of a self-contained unit, power supply, Ethernet repeater, Token Ring MAU or router along with a section of backplane, all enclosed in a case designed so that any group of up to four modules plus a power supply module can only be physically stacked one on top of another in a way that the backplane sections interconnect correctly to form a single hub unit. Only one power cable, therefore no messy plug board.

With the benefit of 20-20 hindsight this is a beautifully simple idea and one with the handy side-effect that such a stack can be easily pre-configured and tested at head office, then shipped complete to a remote site for installation. Any required software configuration which cannot be performed during pre-configuration at head office can be done remotely via the router module.

SnapLAN modules may be used as standalone devices in conjunction with a plug-pack-style 'Power Cube,' or as a stack of up to four modules, in any mix, powered by a full size power supply module. The modules currently available are an unmanaged Ethernet Hub Module in 8- and 16-port configurations (10Base-T via RJ-45), an unmanaged 12-port Token Ring module (RJ-45, STP or UTP; supports both 4 and 16 Mbps, and speed-mismatched ports are automatically locked out), and both Ethernet and Token Ring SNMP management modules. The Ethernet module also provides four 10Base-T ports, while the Token Ring unit provides 4 RJ-45 user ports and a single MAU port. Either unit can be used as a standalone managed hub. Only one management module is required per media, per stack.

The router module has been designed by ADC subsidiary Fibermux, runs Wellfleet's routing software, and is fully compatible with all Wellfleet routers. The unit can be fully managed via Wellfleet's Site Manager management software, while the SnapLAN management modules can be managed via Fibremux's LightWatch/Open, which runs under Unix and Windows, or via a standalone management package.

PRODUCT SUMMARY

Name: ADC SnapLAN family

Description: Stackable hub design 'snaps' together without cables. Supports mixed Ethernet and Token Ring in both managed and unmanaged configurations

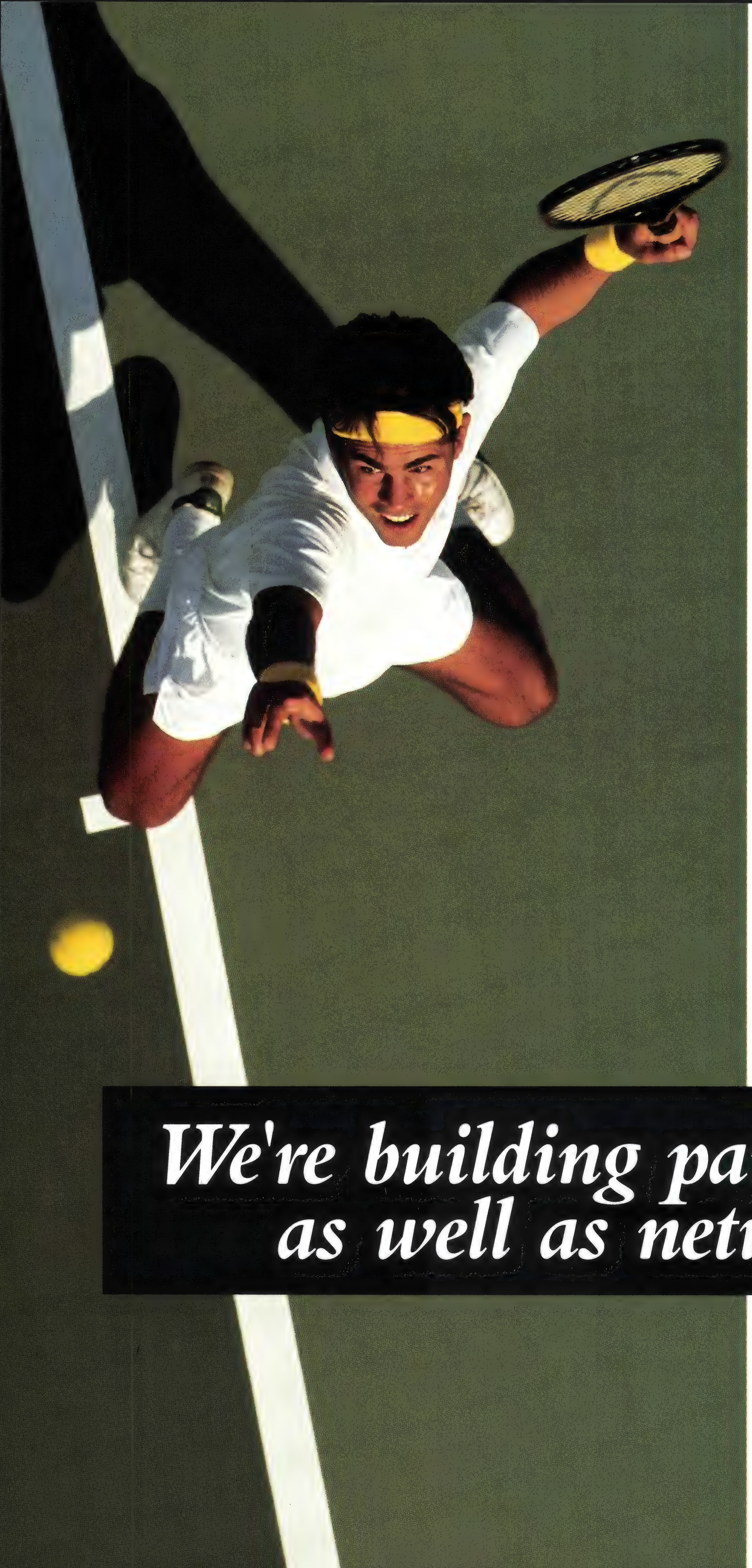
Price: Ethernet Hub Module $1,097 (8 port) $1,903 (16 port); Ethernet Management Module $1,944; Token Ring Hub Module $3,218; Token Ring Management Module $3,218; Wellfleet Router Module $6,444 to $10,477; Power Cube $153; Power Module $476 (All prices RRP excluding tax)

Vendor: ADC Telecommunications Australia, 5B/4 Skyline Place, Frenchs Forest NSW 2086 Tel: (02) 975 1499

The Wellfleet Router Module supports up to two WAN interfaces (synchronous 1,200bps to 2Mbps, RS-232, V.35, X.21 and V.28), can simultaneously route Token Ring and Ethernet, and provides local bridging and routing between Token Ring and Ethernet. Protocols supported include IP, IPX, NetBIOS and DECNet.

ADC's SnapLAN is an innovative variation on the theme of the low cost stackable hub. It does, however, have its limits — as ADC freely admits. For example, there is not, at present, a redundant power supply module. The lack of such a module might be perfectly acceptable for a simple workgroup hub, but such a module will often be a necessity for a remote router. The hub also lacks any form of built-in backbone connection like a fibre or AUI port for Ethernet (there is the Token Ring MAU port). If the unit is to be used in conjunction with a chassis-based hub in a collapsed backbone configuration then an external 10Base-T-to-fibre transceiver or similar device must be used. Over all, however, the advantages of ADC's SnapLAN easily outweigh its limitations in the sort of applications for which it is intended — although convincing your boss that building a LAN around 'snappable' technology might have its moments.

Graeme Le Roux



“We can sell the Tennis Centre (16,000 capacity) in about 20 minutes.”

Manager Information Systems
Bass Victoria Ticketing

Making the business of the box office run smoothly across the State of Victoria is what JNA is achieving for Bass Ticketing.

JNA Network Services gets to know your business first, and your business goals, before extending the network. The technical expertise follows. And that is considerable.

For over 30 years we have implemented complex inter-networking solutions for banks, retail chains and government, city-to-city, building-to-building, floor-to-floor. And we get it right.

So see us first. It is quite likely you need more than a network integrator; you need a business partner. Call us now on: Sydney (02) 417 6177; Canberra (06) 273 5044; Melbourne (03)532 8555; Brisbane (07) 870 3434.

We're building partnerships as well as networks.

JNA Network Services

Innovators in Business Connectivity

A division of JNA Telecommunications Limited A.C.N. 005 438 643

J644

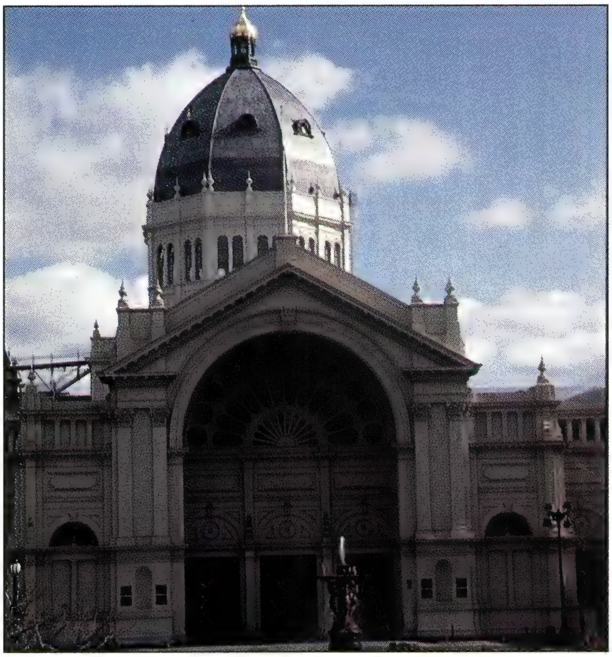
ATUG'94 to Tilt at US Challenger

Responding positively to a challenge from the US exhibition group, Interop+Networld, which is believed to be considering the commencement of operations in Australia, the Australian Telecommunications Users Group (ATUG) plans for the first time to install an on-site interoperability network at its 11th annual show in Melbourne next month.

The aim of ATUG's Interop. Network (AIN) is at least twofold. First, and most obviously, it will allow exhibitors to demonstrate the interoperability of their products. Second, it will signal what some exhibitors consider to be long-overdue recognition of the importance of data networking companies in an industry where the once disparate realms of information technology — computers and computer networking, and the various forms of telephony — are rapidly converging.

The AIN will also redress a perceived 'imbalance;' while in past shows data communications and networking vendors have occupied around 80% of the exhibition space, they have tended to live in the shadow of the enormous stands held by the carriers and the major telecommunications companies. Significantly, the event is now titled the 'Australian Telecommunications and Data Networking Conference and Exhibition' with the theme, *Smart Communications for Smart Business.*

Estimated to cost anywhere between $100,000 and $250,000, the AIN will involve an FDDI fibre backbone to provide bandwidth to the whole exhibition. A layer of routers and concentrators will connect exhibitors to the backbone as well as to the outside world and global networks such as the Internet. The AIN will cater for systems ranging from telephones to PABXs, hubs, routers, LANs and WANs.


Melbourne's beautiful Royal Exhibition Buildings will host ATUG'94

A joint venture between ATUG and Riddell Exhibition Promotions, the AIN has been developed over the past few months with consultancy from Amos Aked Swift. JNA Network Services has provided the design and will be network manager, while a range of companies, including MM Cables, Cabletron Systems, SynOptics and many others have volunteered equipment.

Another innovation this year will be the Service Providers Action Network (SPAN), designed specifically to promote telecommunications service providers and industry groups in areas such as audiotex, teleconferencing, telemarketing, resale and mobile communications. Live demonstrations will cover e-mail, voice-mail, electronic data interchange, broadband services, Pay TV and teletext.

The formula appears to be working well. The 13,000 square metres of Melbourne's recently revamped Royal Exhibition Building, including the Great Hall and the Western Annex, has already been sold out, with over 150 exhibitors expected to be booked for the May 2-5 show. By comparison, last year's event at Sydney's Darling Harbour covered 10,000sqm, with around 130 exhibitors.

As for the challenge to ATUG from Interop+Networld, some interesting insights come from Alan Power, CEO and Managing director of the APN Computing Group. Power has close links with US publishing giant Ziff-Davis, which owns the Interop+Networld operation based in Mountain View, California. Power is also behind the Australian launch of a Ziff-Davis monthly magazine, *Windows Sources*, covering products in the Windows environment.

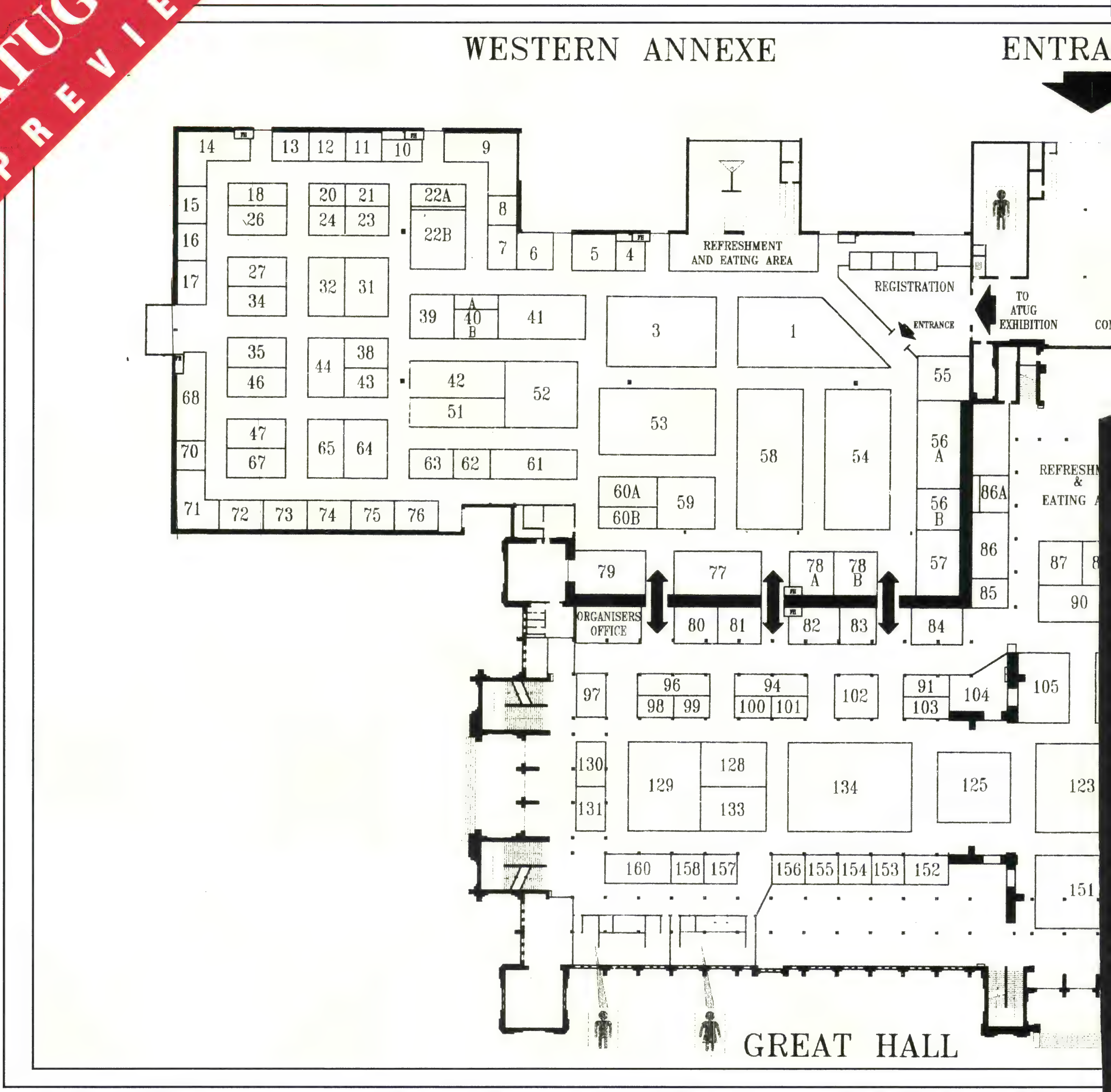
Power indicated to *Australian Communications* that Interop+-Networld (the 'Networld' part derives from a deal between Ziff-Davis and Novell) would very likely not be staged in Australia until at least 1996, because the Ziff-Davis group was more concerned with penetrating the larger markets of Germany, France and Japan, and emerging markets like Mexico and Canada. A 1996 start-up for Interop+Networld, which would be staged in Sydney, would avoid any possible clash with the ATUG show, which rotates back to Darling Harbour in 1995, and then to Melbourne in 1996.

"The Australian marketplace is seen as a good opportunity for Interop+Networld. But while it is very competitive, it is also rather small compared with the others," Power said. "Ziff-Davis will set up an office here when the opportunity arises, but that won't be for two to three years yet."

Power conceded that ATUG would probably see Interop+Networld as a threat, and that this may well have prompted the establishment of the AIN at ATUG'94. "The AIN is an appropriate move by ATUG and if its show improves as a result of the perceived threat, then that can only be good for the marketplace," he said.

But Power said ATUG needed plenty of good luck this year because running networks was a very skilled business. "Having the expertise, as Interop+Networld does, is a tremendous asset because you know how to do it properly and how to juggle a myriad of technical and managerial resources. Australia has great expertise and is very capable of doing anything. But it's a great plus to be able to draw on experience when you want to fast-track a network, as ATUG is now trying to do."

Power said Interop+Networld would expect to attract around 200 exhibitors in Australia because of its strong reputation and the extensive experience gained after six years in the US marketplace. "The Interop organisers fully understand the needs of the cus-



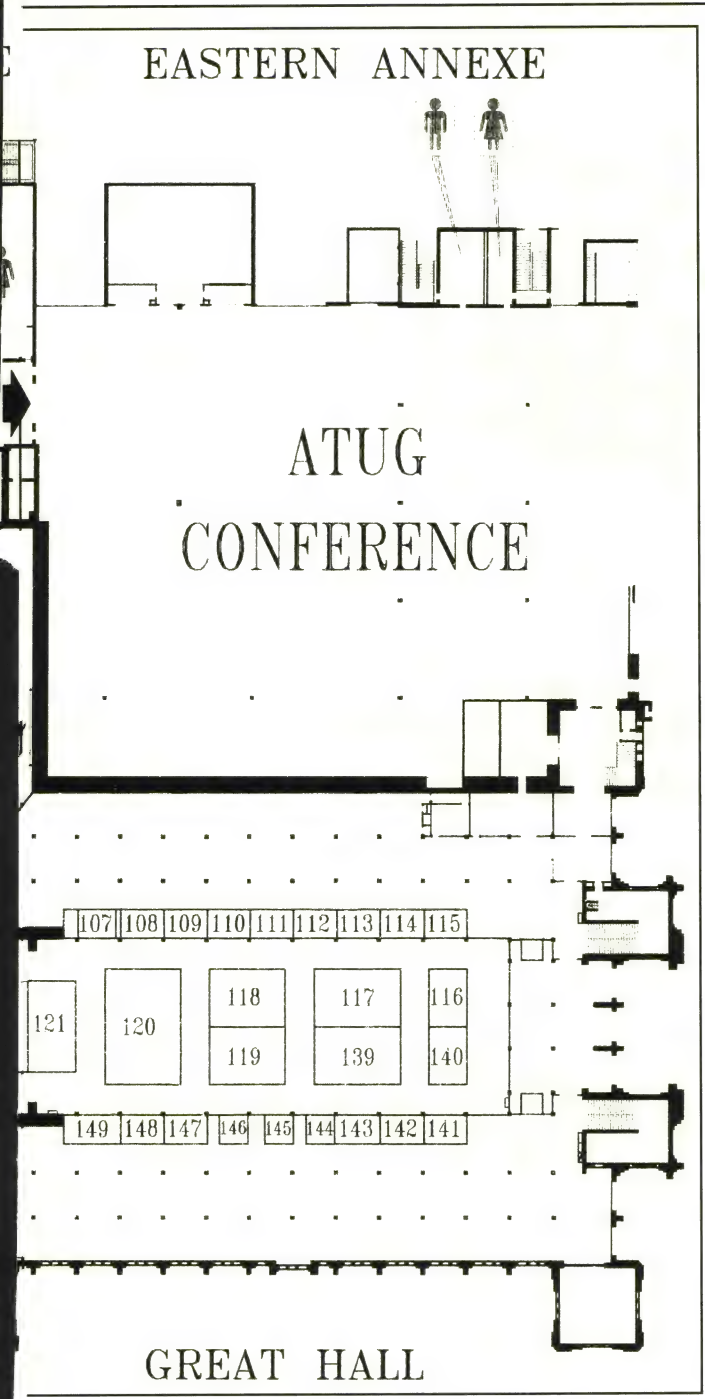
Architects of the ATUG-Interop. Network

Sydney
(02) 417 6177

Canberra
(06) 273 5044

Melbourne
(03) 532 8555

Brisbane
(07) 870 3434



JNA
Innovators in Business Connectivity
A division of JNA Telecommunications Limited A.C.N. 005 438 643
Matrix J818

Guide to Exhibitors

EXIBITOR	STAND
3Com ANZA	35
AAP Communications Services	41
AAP Telecommunications	S2
AC&E Sales Pty Ltd	130
Acsys Incorporated	22B
Active Voice Corporation	99
ADC Telecommunications Inc	57
ADE Network Technology	78A
Advanced Compression Technology	4
AIC Conferences	143
Alcatel Australia Ltd	105
allNET Technologies	119
Anixter Australia Pty Ltd	133
Ascom Tele-Nova Pty Ltd	60A
Ascom Timeplex	122
AT&T Australia Ltd	3
Australian Telecommunications Users Group	108
Australasian Teleconferencing Association	S8
Australian AMP	75
Australian Communications	71
Australian Tel-Tec Pty Ltd	43
AWA Communications	102
Banksia Technology Pty Ltd	85
BellSouth Mobile Data Australia	56A
Bitware	40A
Black Box Catalog Australia Pty Ltd	10
Cable Management Systems	112
Cabletron Systems Pty Ltd	117
Call Processing Systems	6
Canon Australia	81
Cellnet Cellular Wholesalers	157
Century Yuasa	27
CCS Communications	153
Cohpac Communications Systems Pty Ltd	116
Connect International	S22
Dialogic S.E.A. Pty Ltd	97
EDICA	111
Electroboard Pty Ltd	68
Ericsson Australia Pty Ltd	58
Equal Access	142
Faxback Australia Pty Ltd	146
Fibernet Pty Ltd	76
Fujitsu Australia Ltd	53
GEC Alsthom Information Technology	86
GEC Plessey Telecommunications	42
GN Elmi Australia Pty Ltd	59
Hallam Manufacturing Pty Ltd	20
Hardie Networks	121
Hawker Batteries	61
Hewlett-Packard Australia Ltd	90
Huber & Suhner Pty Ltd	16
HyperCom Data Systems	34
IBM Australia Ltd	120
IDG Publications	144
IEI Australia Pty Ltd	104
Inchcape Office Products	118
Information Network Solutions	91
Infotron Systems Pty Ltd	14
Insearch Limited Dialog	S21
Instalcomm Engineering	131
Interquartz (Australasia) Pty Ltd	78B
Kingfisher International Pty Ltd	38
Krone (Australia) Technique Pty Ltd	39
L & B Rittal	64
Link Telecommunications	40B
Logicom International Pty Ltd	154
Madison Technologies	96
Marconi Instruments Pty Ltd	159/160
Maser Technology Group	101

EXHIBITOR	STAND
MCI International (Australia)	52
MCM Telecommsultants	115
Metropolis Waitstate	107
MM Cables	84
Mobile Asia-Pacific	114
MPA International	31
NEC Australia	1
Network Designers KNX Pty Ltd	156
Network General	37/44
Newbridge Networks Corp	125
NewsNet Pty Ltd	148
Nira Australia	94
Nokia Mobile Phones	129
NorTel Australia Pty Ltd	123
NUS International	8
Olex Cables	87
Omni Australia	80
Optelcom Pty Ltd	73
Optus Communications	54
OTT Telecommunications Pty Ltd	S16
Pacific Computer Weekly	12
Pacific Star Communications	S5
Pacrim Financial Network Pty Ltd	S19
Panasonic Australia Pty Ltd	51
Panduit (Aust) Pty Ltd	13
Parity Software	97A
Pascom Voice & Data Comms.	147
Paul Budde Communications	S1
Pegasus Network Pty Ltd	S18
Philips Scientific & Industrial	74A
Phoneware Communication Systems	23
Picture-Tel	65
Proteon Inc	128
Q-Net Australia Pty Ltd	83
Q-Tel Pty Ltd	140
Quante Telecommunications	22A
RAM Communications	103
Reed Business Publishing Pty Ltd	86A
RF Industries Pty Ltd	17
Richardson Pacific Ltd	15
Scientific Devices Australia	145
Scitec Communication Systems	79
SGS Australia	70
Siemens Ltd	26
Signalling Technology Pty Ltd	158
SingCom (Australia) Pty Ltd	47
SITA	149
Skilled Communications	56B
Smart Accessories Pty Ltd	46
SmartCom	46
Stanilite Electronics Pty Ltd	32
SVT Video Systems Pty Ltd	67
SwitchView	113
SynOptics Communications	55
System Solutions Pty Ltd	18
Techmetal Industries Pty Ltd	60B
Technologica Pty Ltd	S4
Techrack Pty Ltd	98
Tech Rentals Pty Ltd	100
Tekelec	122
Tektronix Australia	5
Telecom Australia	134
Telecom NZ	82
Telsis Pty Ltd	88
The Siemon Company	155
The Australian	131
Uni-x Technology	72
Utilux Pty Ltd	63
Vodafone	77
Vicom Australia	62
Wandel & Goltermann	7
Wedgetail Technologies Pty Ltd	24
Wellfleet Communications	106
Westwick-Farrow Pty Ltd	21

tomers, from the wide area and local area network level down to the desktop. That's why it has become the premier network show in the US. Interop+Networld attracts around 60,000 people, compared with 150,000 for Comdex, so that shows a very rapid growth trend." A Visitor Guide to Interop 93 in San Francisco last August outlines the complexity of the event's on-site network: 'INTEROPnet has evolved into a complex, enterprise-wide internetwork supporting both production and experimental networks with six media and protocol families, and WAN components and applications supporting more than 5,000 hosts . . .'

Divided Loyalties?

Interop+Networld appears to enjoy enthusiastic support among Australian data communications/networking companies, including SynOptics, Cabletron Systems and Proteon, whose managers are keen to see the event staged here. However, both SynOptics and Cabletron, as well as many others, say they remain committed to ATUG and have volunteered equipment and manpower for the ATUG Interop. Network at the Melbourne show.

Proteon's Managing Director, Rob Willis, was less enthusiastic about ATUG, saying his company regarded Interop+Networld as a more appropriate showcase for its products. Revealing his company had slightly reduced the size and budget of its ATUG'94 stand, Willis said: "There isn't really any alternative to ATUG for data communications/networking companies, so they're compelled to fit with the telecommunications people. But if there was an alternative, like Interop, you'd see a lot of companies moving to that venue. I've spoken with Interop people in Japan and what they're doing fits in perfectly with what we want." He estimated there were up to 100 data comms/networking companies in Australia, including transnational branch offices and local value-added resellers.

Willis added that one of the major problems with the ATUG expos was the name itself. "The show title is a mouthful and if you say ATUG to people, it's not immediately obvious what it is. This industry is exploding with lots of new people coming in, and my feeling is that names like Network World and Interop give a clearer idea of what those events are about. If you want people to come to a show, you must get across clearly what it's about."

Asia-Pacific General Manager of SynOptics Communications, Steve Wood, told *Australian Communications* his local operation would have little hesitation in exhibiting at an Interop+Networld expo in Australia, just as the various SynOptics subsidiaries around the world did. "Interop started as an industry awareness group to improve interoperability and it has now grown so big that companies have to demonstrate their knowledge of interoperability before they are accepted. This is part of our core business, so there's little doubt we would be involved," he said.

Wood said the AIN was "a step in the right direction" in terms of addressing the needs of the networking vendors' target markets. As a result, SynOptics planned to maximise its exposure at ATUG-'94 and had volunteered equipment and resources for the AIN. He revealed that SynOptics had proposed just such a network to ATUG two years ago, offering to design it and supply equipment. "We even made templates for what we did at another trade show. We're happy they have finally decided to put a show network together."

Senior Systems Engineer with Cabletron Systems, Steve Bird, said he would welcome the staging of an Interop+Networld in Australia, though his company remained committed to ATUG and had increased its stand space four-fold this year, as well as offering equipment for the AIN. "Cabletron is closely involved with Interop in the US and demonstrates a lot of first-release products there, so we would exhibit at Interop in Australia. Data communications and networking, telephony, WANs, LANs, ATM and other technologies are rapidly becoming one industry and ATUG has clearly recognised this by installing the AIN."

ATUG's Deputy Executive Director, Richard Allen, said he did not see Interop+Networld as a direct threat to the ATUG expos. "Whether or not Australia can really offer a serious opportunity for Interop is debatable," he said. "In the meantime, we'll be demonstrating interoperability with our own ATUG-supplied and operated network. The AIN is a natural stage in the development of convergence, which has become more and more of a reality with pay TV, fibre to homes, etc. But up till now, there really wasn't a clearly defined market for which to demonstrate internetworking and interoperability products. The evolution of communications technologies means that whether it's data or telephony, it'll all go down the same pipe, and people who want to sell products for this market will see ATUG'94 as the ideal place to demonstrate them."

However, Allen said ATUG could improve the image and appeal of its shows by re-examining the title. "Some people consider the choice of name to be unfortunate, given that 'telecommunications' means 'communications from a distance.' We could perhaps make use of the word 'network' somewhere in the title."

ATUG'94 organiser, Graeme Riddell, said he expects between 12,500 and 14,000 people to visit the exhibition, up from the 12,100 who attended last year's show at Darling Harbour. He said between 950-1,000 people are expected to take part in the conference stream, down just slightly from the 1,000-plus at ATUG'93 in Sydney. He added the Royal Exhibition Buildings should prove to be an exciting venue after a $5 million face-lift over the past 12 months. Because of the heavy bookings, more work had been done to open up an extra 500sqm of space that had not been previously available.

Bernard Levy is a freelance journalist based in Rosebank, NSW.

A Communications Smorgasboard

For ATUG'94 visitors, the smorgasbord of exhibits will range from niche-market stands to the huge spaces booked by the carriers and major manufacturers and vendors. Demonstrations will cover not only the leading-edge products and services of today but those planned for the coming era of the 'information superhighway' based on emerging broadband technologies.

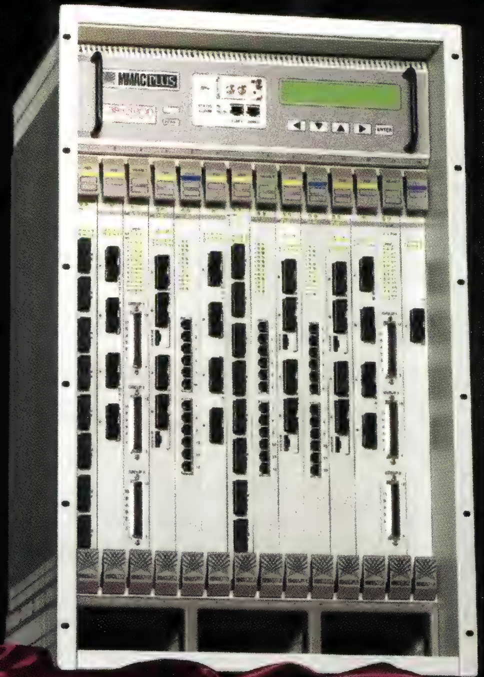
Telecom Australia has the largest stand, at over 200sqm, closely rivalled by Optus and industry giants such as Ericsson, Alcatel Australia, NEC, AT&T, GEC Plessey Telecommunications, IBM, Nokia, NorTel, Fujitsu, and MCI. Other industry heavyweights include AAP Telecommunications, BellSouth Mobile Data Australia, Canon Australia and Telecom New Zealand. To add some visual spice, Finnish vendor Nokia plans to make the J.J. Giltinan World Championship 18-footer skiff the centrepiece of its display.

For those interested in learning about all aspects of telecommunications, the ATUG'94 conference offers the latest information from local and international industry experts. The opening day, Tuesday, May 3, will feature a Communications Update Seminar with addresses from Communications Minister Michael Lee; ATUG Chairman, George Maltby; ATUG Executive Director Wally Rothwell; and Austel Chairman, Robin Davey. Running concurrently, a Telecommunications Basics Forum will hear speeches from Telecommunications Ombudsman Warwick Smith; Commonwealth Privacy Commissioner, Kevin O'Connor; and speakers from Telecom, Optus, AAP Telecommunications and others.

The next three days feature an impressive array of speakers from Australia and around the world including technical experts, public sector administrators, systems integrators, lawyers, standards architects, service providers, and representatives from the Sydney 2000 Olympics Committee, who will outline Australia's communications needs for the big event.

For conference delegates seeking new industry contacts and some light relief after attending seminars, each day will feature a cocktail party at around 6pm.

THE COMPETITION IS FINISHED.



Introducing the MMAC-Plus™

The industry's *first* and *only* packet switching hub.

With the MMAC-Plus, you'll never have to compete for bandwidth again. That's because the MMAC-Plus features integrated switching technology to support both packet-based and ATM cell-based networks. Now you can create dedicated user-per-port LANs that will provide for many classes of service and still guarantee that each user receives the fast, reliable service he or she needs.

Through a unique packet/cell switching backplane and Cabletron's innovative SecureFast™ Packet Switching, the MMAC-Plus delivers the best benefits of ATM technology. . . while preserving your existing investment in Ethernet, Token Ring and FDDI.

Features:

- An aggregate bandwidth in excess of 10 Gbps.
- Aggregate switching over 5 million packets/cells per second.
- Over 500 ports of connectivity.
- Supports over 160 switched LAN segments.
- Supports integrated MAC layer bridging, network layer routing, SecureFast Packet Switching and ATM cell switching.
- Embedded network analysis tools.
- Fully fault tolerant design.

CABLETRON SYSTEMS
The Complete Networking Solution™

A hub is not just a hub. For more information on the Next- finishes, call *(02)950-5900* for your *free*, informative

dney 61 2 975 3737
lbourne 61 3 764 2111
ckland 64 9 524 1307
llington 64 4 237 9144

Balancing today with tomorrow

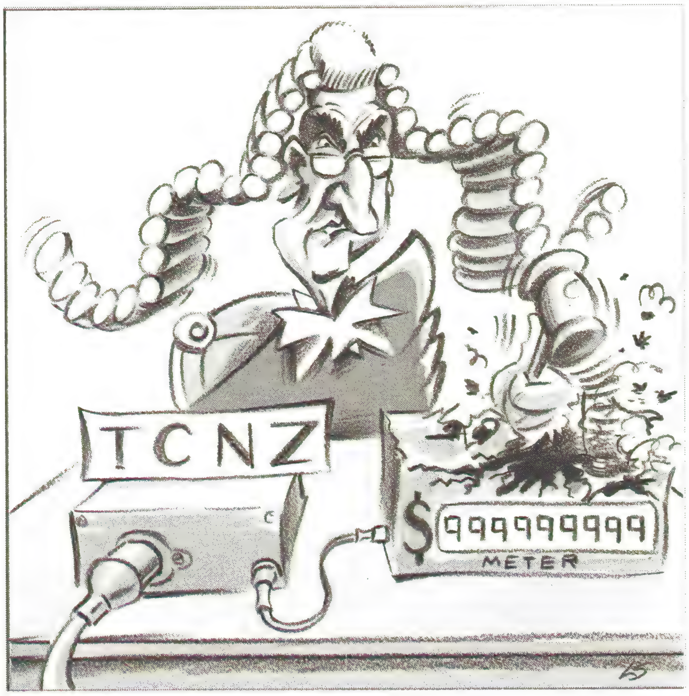
At Fibernet, we offer networking expertise second to none. Smart fiber backbones for future-proof networks. Structured cabling systems for optimum flexibility. Networks that are designed specifically for your individual needs. In fiber, copper and hybrid cabling environments. We make the right connections. Carefully and correctly. If you'd like to talk to us about complete networks, or just some of our smart connections, call Fibernet. Quick smart.

▸ Network products ▸ Design and installation ▸ Building cables
▸ Structured fiber cabling hardware
▸ Air Blown Fiber™ (ABF) cabling
▸ Installation and test equipment
▸ Optical connections.

Clear Reminders on Interconnect Pricing

The court battle between Clear Communications and TCNZ over interconnect charges revolved around the issue of access pricing. Brent Fisse reviews the recent decision of the NZ Court of Appeal.

The Court of Appeal of New Zealand recently allowed the appeal by Clear against the finding of the High Court that, if Telecom NZ's interconnection charges complied with the so-called 'Baumol-Willig Efficient Component Pricing (ECP) rule,' Telecom NZ would not misuse its dominant position in the market for standard switched telecommunications services.



The Court which originally heard the matter found that Telecom had misused its dominant position by asking Clear for more than ECP rates, but ruled that, since Clear would not have agreed to ECP-based charges, it had not suffered any loss. In a 'commendable effort to integrate legal analysis with economic reasoning,' (see *Legal Line*, March 1993 edition), that Court ruled that:

- For calls from the Telecom customer to the Clear network, Clear could charge Telecom Telecom's average incremental costs (AIC) saved as a result of Clear carrying part of the calls;
- For calls from a Clear customer to Telecom's network, Telecom could charge Clear its call rate less Telecom's AIC saved as a result of Clear carrying part of the calls;
- For access to the PSTN, Telecom could charge Clear the equivalent of its line rental less Telecom's AIC saved as a result of Clear providing part of the loop; and
- Actual expenses incurred by Telecom in connecting Clear to the PSTN would be payable by Clear.

The Court of Appeal disagreed with the High Court, on the basis that part of the Baumol-Willig ECP rule was inconsistent with the prohibition against misuse of a dominant market position under Section 36 of the NZ *Commerce Act* (Section 36 is comparable to Section 46 of the Australian *Trade Practices Act*). Telecom was entitled to a 'reasonable return' but, contrary to Section 36, the ECP rule would allow it to make monopoly profits as well.

The decision on appeal has driven the parties back to the negotiating table to try to agree on a 'reasonable return' for Telecom. Since reasonable people can easily disagree on what the Court of Appeal meant by 'reasonable return,' it is unclear what the outcome will be. If negotiations break down yet again, the result is likely to depend on arbitration or possibly intervention by the NZ Government.

Unprincipled Regulation

One much-vaunted ideal for a privatised telecommunications industry is that regulation be 'light-handed,' with pricing and other conduct in the market determined as far as possible by competitive forces. This ideal has been especially influential in New Zealand, where there is no regulatory authority corresponding to Austel. Pricing of interconnection charges has been left to the carriers to settle among themselves, with the general competition laws under the *Commerce Act* providing a safeguard in case a dominant carrier abuse its market power.

Faltering Experiment

The latest Clear decision demonstrates the problems of the New Zealand experiment. The President of the Court of Appeal, Cooke P, expressed this regret:

> "We are not a price-fixing authority. The most that can be done is to state a principle, which can only be that Telecom is entitled to a fair commercial return for granting Clear use of the network assets, without regard to the present monopoly. So far the long drawn-out proceedings have benefited no one apart from Telecom, for the entry of Clear into the market has been delayed."

The fundamental reason why the New Zealand approach has broken down is the lack of pricing principles. Interconnect pricing principles are essential for ensuring that dominant carriers act efficiently and competitively: in order to determine whether pricing is efficient or competitive it is necessary to apply some agreed criterion. The pricing principles therefore also need to be settled in advance rather than left to the costly after-the-event process of litigation. The former up-front approach was taken by Austel in 1991 in its Study of Arrangements and Charges for Interconnection and Equal Access, a pathbreaking work which, at least during the critical initial phase of the establishment of competition, has helped to avoid costly and sterile disputes over issues relating to interconnect pricing principles.

Non-Existent Theory of 'Reasonable Return'

Given the detailed consideration of interconnect pricing principles in the Austel report, it is remarkable to find no reference to them by the Court of Appeal. Instead, Mr Justice Gault said it would be legitimate for Telecom to recover "the incremental costs (including fixed and common costs)" and "incremental costs (including common costs) and a reasonable return for providing the interconnection services that would be recoverable even in a competitive market." Unlike Austel's specific account of pricing principles, the Clear decision leaves a number of key questions up in the air:

- 'Incremental costs' seems to mean long-run incremental costs (LRIC);
- 'Fixed and common costs' and 'common costs' perhaps smack of fully distributed costs (FDC), but FDC was not the meaning intended: the position taken was that the price charged should mimic the charge that would be made in a competitive market and FDC would not be the basis of pricing in a competitive market;
- 'A reasonable return' was left undefined but some pointers emerge from the judgments: 'reasonable return' means something more than LRIC or directly attributable incremental costs (DAIC) — the amount is LRIC + X or DAIC + X, where X is unknown — 'reasonable return' does not mean FDC;
- Unlike the DAIC and directly attributable costs (DAC) principles laid down by Austel for CAN access charges, the Clear conception of 'reasonable return' seems to include some allowance for the capital costs of the existing network;
- Opportunity costs are excluded (e.g. what Telecom would lose by giving access to Clear and thereby losing some of the business it would otherwise have) ; and
- 'Reasonable return' excludes the costs incurred by Telecom in meeting its Kiwi Share Obligation to provide free local calls for residential subscribers.

As President Cooke indicated, the Court of Appeal is hardly a price-fixing authority. Nonetheless, the pricing principles set out in the Austel report are relevant to the issue of abuse of a dominant market position and should have been considered. A critical comparison of Austel's approach with that of Baumol and Willig would have been highly instructive. It might also have prompted a more useful indication of what is meant by a 'reasonable return.'

Avoiding the Clear Syndrome

The incomplete treatment of interconnect pricing principles in the Clear case is of little help to carriers. Access pricing has make or break implications, especially for new entrants. Stable, agreed and precise principles are essential for making reliable forecasts and sound decisions about marketing and network roll-out. The Court of Appeal's decision demonstrates the difficulties which could be encountered were the DAIC principle to be abandoned or compromised in the Australian interconnection context.

If DAIC were over-turned, it is impossible to predict what principle, if any, would replace it. One obvious contender is FDC. Although FDC has long been discredited among economists and was firmly rejected in the Austel Report, the alternative models are various permutations of LRIC + X, with the amount of and theoretical justification for the 'X' factor varying. However, the 'economic jury' is still out on these models. Thus, if DAIC is abandoned, there is no clear model to move to, although the Clear decision may have knocked out ECP as one of the competing alternatives.

Monopoly power — RIP for ECP?

An important feature of the Clear appeal is the Court's frank recognition of the monopoly power enjoyed by an incumbent carrier in relation to new carriers. Monopoly endowment was central to the Court of Appeal's decision to over-rule the High Court's finding that Telecom would be safe under the *Commerce Act* if the charges imposed on Clear were based on the Baumol-Willig ECP rule.

The opportunity cost element of the ECP rule was flatly rejected by the Court of Appeal. The main reason was that recovery of opportunity costs under the ECP rule would partly include monopoly profits (Telecom would be recovering part of the profits it would have made when the sole carrier) and that recovery of monopoly profits would be an abuse of a dominant position contrary to Section 36 of the *Commerce Act*. As President Cooke explained:

"[The ECP rule] would amount to allowing a new entry into a market on condition only that the competitor indemnify the monopolist against any loss of custom. That would be at once an unreasonable use of monopoly power, a restriction on entry, and a prevention or deterrence of competitive conduct. And . . . a substantial purpose of the monopolist in laying down such a condition is to restrict competition so as to preserve its own position as far as possible."

The opportunity cost element of the ECP rule has been dealt a severe body blow, but the Clear decision does not affect another major element of the rule. The principle of 'competitive parity,' or the 'imputation principle,' as it is often known, survives intact: a supplier of network services must charge the same price as it charges itself, allowing for any differential cost (under this principle, Telecom's access price to Clear could not exceed its own retail loop charges, minus any net savings in incremental costs resulting from the usage by Clear).

The Information Bottleneck

Incumbent carriers control the information required to assess costs and the extent of any cross-subsidisation. By bottling up this information it is of course possible to obstruct attempts by other parties to work out a competitive price for access charges.

The reality of monopoly leverage by squeezing competing carriers through the 'information bottleneck' comes out strongly in the judgments of the Court of Appeal. Administering the ECP rule would require complex periodic reviews of Telecom's changing opportunity costs. As President Cooke said: "Such a system would mean a vista of continual disputes or arbitrations, so daunting in itself as to transgress the *Commerce Act*. Such a system would never be agreed to by an entrant not faced with the hurdle of market dominance by the monopolist."

Delay in negotiations could also amount to an abuse of a dominant market position. As it happened, negotiations in the Clear case had not reached that point, "but no one could predict with any confidence that it will not come in the future."

No guidance was given as to whether reliable information from Telecom should be made readily available to Clear and the courts, or the form in which such information should be provided. The role of the court under New Zealand's 'light-handed' approach is to decide issues of competition law; it is not to give directions or lay down accounting procedures of the kind set out in Austel's COA/CAM manuals.

However, the primary emphasis in the Australian environment remains on the carriers directly negotiating interconnection charges, including renegotiating the initial charges specified in the Ministerial Pricing Principles once the relevant triggers have been reached and Optus either has decided not to call a dominance inquiry or has failed to establish Telstra's dominance. Negotiating reasonable interconect charges without costing information being available to Optus (and Vodafone) can be both problematic and unbalanced.

It is also far from clear that sufficient costing information is available to Austel from Telstra to make an effective analysis of possible inefficiencies in access pricing. It is also unclear whether econometric models or other methods have been deployed and are capable of effectively measuring the incremental costs of different kinds of services. The Australian information bottleneck may be less significant than that in New Zealand, but, as we are reminded by the Clear litigation: why should it remain at all?

Brent Fisse is Professor of Law at the University of Sydney and consultant to Gilbert & Tobin, Technology Lawyers. The writer expresses personal opinion in this column and not the views of any clients of that firm.

Vodafone — Out on the Digital Limb

John Rohan

Managing Director, Vodafone Pty Ltd

John Rohan joined Vodafone Pty Ltd last year after more than 26 years of experience in the electronics, construction and building industries, most recently as executive general manager of James Hardie Building Services and Technologies. He has a degree in Mechanical Engineering, a Post Graduate Diploma in Industrial Engineering, a Masters Degree in Business Administration and is a Fellow of the Institution of Engineers Australia. Liz Fell spoke with him at Vodafone's Asia-Pacific headquarters in Sydney.

What happened to Arena GSM, the original bidding name used by Vodafone?
Rohan: It was the name we used purely for the bid vehicle.

AC: *Then it disappeared?*
Rohan: Yes. It was before my time. I didn't join Vodafone until May.

AC: *I read that Vodafone is the world leader in GSM. Is that because of the number of licences it has won around the world?*
Rohan: Well, we had the first commercial network, we're in 13 different countries, and we've been with the development of GSM from the very early days.

AC: *Australia aside, within the last year or so, what other licences are starting up?*
Rohan: We've recently won licences in Fiji and South Africa, and we're in Greece, Germany, Sweden and France.

AC: *Are you reselling through Vodac and operating a network in France?*
Rohan: Yes. In some countries, we have a Vodac as well.

AC: *What about Asia-Pacific licences?*
Rohan: Hong Kong, where we're part owner of one of the networks and, of course, Fiji and Australia. We're actively looking for further licences in this area.

AC: *With networks starting up here and South Africa and Fiji, does that put a strain on Vodafone's technical and management resources?*
Rohan: They've been fairly well programmed in the sense that they're not all starting at the same time, they're a few months apart. We certainly have very good Computer Aided Design equipment and that sort of thing to lay out the networks. We've had 12 secondees from the UK here too, but they're starting to go back now. We decided many years ago to move round the world and grow the licences so we have a good team of people available to go to other countries.

AC: *And the original announcement said that Australia was to be the Asia-Pacific headquarters?*
Rohan: That's right.

AC: *Where does the Hong Kong office fit in?*
Rohan: We have a sales office, a marketing office, in Hong Kong. That's where we have a Marketing Director of Vodafone International who is looking for licences through Asia and the Pacific.

AC: *If Australia is the headquarters, does the Marketing Director work to you?*
Rohan: No. He works for Vodafone International. This is the headquarters for Australia-Pacific.

AC: *What does that mean?*
Rohan: Well, Hong Kong is obviously much closer to the markets that we're currently interested in.

AC: *Does Fiji fall under Australia?*
Rohan: It will eventually. We assisted in preparing the bid and we're training the people, but at this stage it's run out of Fiji.

AC: *What about UK expats?*
Rohan: Yes. We have some expats in Fiji. We're also using people out of here to assist in personnel and finance. We have very much a matrix organisation around the world. We have an international division. And you've got to remember that we don't own those licences fully. We're a partner in those licences.

AC: *Yes. I'm just trying to come to grips with what it means for Australia to be Vodafone's Asia-Pacific headquarters, a major promotional point when you got the licence.*
Rohan: That will grow over the years. We're assisting in getting licences, we're assisting with people, we're assisting with training. Our major aim is to get Australia up and running, and that's a big job.

AC: *You've adopted the Vodac model from the UK here. How many other service providers are you planning?*
Rohan: We've currently got nine, and we will probably go to around 15.

AC: *And Vodac competes with the other eight?*
Rohan: Yes. We only deal through service providers everywhere in the world. That's how we do business. We don't deal in any other way.

AC: *When you say 'we' are you are talking only about Vodaphone?*
Rohan: Yes, Vodaphone. Vodac does not come under me. It's the same anywhere around the world: The Managing Director of the network does not control Vodac. It's a service provider like any other. The difference is that it's very much arms-length. We wouldn't have the service providers in the UK, which is in excess of 30, if we didn't treat Vodac very much at arms-length. Vodac is not treated differently.

AC: *But Vodac is in this building?*
Rohan: That's temporary. That will change.

AC: *To attract other service providers, I assume that you have to guarantee similar treatment for Vodac?*
Rohan: Absolutely. The other important point is that there are service providers in the UK who want to come to Australia and they work under the same situation there. They

see that we treat all service providers equally and fairly, otherwise they wouldn't want to come. The other big difference is that service providers can deal with any network. We don't say they must deal with us.

AC: *So there's no exclusivity?*
Rohan: No.

AC: *Does that include Vodac?*
Rohan: No. Vodac has to deal with us. In a sense it might be said they have a disadvantage because they can only deal with us, whereas the others deal with our competitors. If we start treating Vodac unfairly, then they would put all their subscriptions to the other networks. But the big difference is that we're the only network at the moment in Australia who deals exclusively through service providers. We do that worldwide. We preach that. We do not own the subscribers.

AC: *There's a phrase that mobile licences deliver 'rivers of gold'?*
Rohan: I don't know if it's a 'river of gold' when you look at the investment that needs to go in.

AC: *Surely you would agree the investment is much less than in the fixed network?*
Rohan: We've paid $140 million for the licence and we're spending $600 million on the network. That's a very large amount of money in anyone's terms. There must be a return on that.

AC: *There appears to be very little price differentiation right now between analogue and digital and, indeed, between the digital services themselves?*
Rohan: That's correct to a point. But we will have 15 service providers who are really mini-telecoms companies in their own right, rather like mini-Optuses, and when I say mini, some will have $150 million in turnover. They have the right to set tariffs and to put out various offers to the marketplace. That's where we're different. Through our service provider approach, we actually do deregulate the market quite dramatically. They're going through routes of the market that you may not necessarily see. That is the real advantage of service providers.

AC: *Yet there is little price differentiation?*
Rohan: That's correct with the published prices of the three networks. But our service providers can charge what they like, and they are.

AC: *What are the financial arrangements with service providers?*
Rohan: They get a percentage of the airtime and access.

AC: *Is there a payment beyond that?*
Rohan: No. Purely on revenue, which includes airtime and access. We get a percentage of the airtime and they get a lesser percent.

AC: *Yet a newspaper advertisement for Vodafone this morning featured an access price and so on. Are you saying that's really Vodac because the word Vodac is in tiny print at the bottom?*
Rohan: Yes. In other ads, you'll find ADS [Australian Digital Services] where Vodac is there. They are selling Vodafone.

AC: *So they have ads too saying: 'Join the Vodafone digital revolution'?*
Rohan: Exactly the same. Phoneplus, which is Stanilite, could and does run with the same ad. If you look at the papers you'll find a lot of ads run by the other service providers that are no different from the way that is done. That ad actually involves buying the phone as well.

AC: *Have you changed your advertising recently? For instance, the billboard in William St [Sydney] is different.*
Rohan: Well, we weren't happy with what the advertising agency had done or the people putting the sign up there.

AC: *Did you like the full-page ads Vodafone ran through the daily papers?*
Rohan: I think they had effect.

AC: *Is it true that the MD of Vodac from the UK is here helping you with marketing?*
Rohan: No. He controls all the service providers worldwide. He is here as one of the secondees for a limited period of time. But this was always part of the plan.

AC: *So have you changed your marketing and advertising?*
Rohan: Not at all.

AC: *It's just that instead of the big pages there are smaller ads which you can read and understand now.*
Rohan: But those are the service provider ads. The other ads are the same sort as when we started.

AC: *The one which has the big print that is hard to read?*
Rohan: It's interesting. I do a lot of talks to various groups and they've all noticed. The whole thing about advertising is to get people to notice it. I think it's had a very good effect. The few people that dislike it, nevertheless read it.

AC: *If some service providers are bringing prices down, why are a reported 40,000 customers a month signing up on the analogue network? What number are you signing up?*
Rohan: I don't intend to release that figure, but we're very happy with it.

AC: *Let's say you have 5,000 . . .*
Rohan: No. I won't make a comment because that's something we obviously want to keep to ourselves. We have a huge percentage, a huge percentage, of those going on digital.

AC: *That must be a tiny percent of those actually signing on to mobile. If you were cheaper, surely customers would flock to you?*
Rohan: Not necessarily. People have got an analogue phone and they're going to use it.

AC: *Are you saying that the 40,000 have analogue phones already?*
Rohan: Some do. They're either trading them in or passing them down through the company or the family. I think the people that are buying at the moment do have phones, but they like the security they get with digital and the minimal drop-outs.

AC: *Is it correct that you have had discussions with Telstra about analogue resale?*
Rohan: We will not be reselling analogue.

AC: *But did you have discussions?*
Rohan: No. Under our licence, we have the right to resell. We have decided not to do that.

AC: *So there have been no discussions?*
Rohan: Obviously over time, through interconnect, you talk about these things. But we're not going to resell analogue. We wouldn't want to. Analogue at the moment is a churning game between Telecom and Optus. Dealers are setting up churn teams. That is not growing the market. Digital will sell on its benefits and the fact that analogue has a limited life in Australia.

AC: *But Vodafone must have considered the strategy of reselling analogue and then migrating customers to digital?*
Rohan: When we went for the licence, it was a good option to have. But once we got into the market, we realised digital will sell on its advantages.

AC: *With digital, of course, there is no number portability. Am I correct in saying that if I sign with Telstra and change to Vodac, I must change my mobile number too?*
Rohan: Yes, because each of us has different numbers in the 041 range. Optus has 1-2-3, we have 4-5-6, and Telecom has 7-8-9.

AC: *Won't that reduce choice for customers because it's inconvenient to change numbers?*
Rohan: You have to change your number to go from analogue to digital.

AC: *But lack of number portability for digital customers must act as a barrier to changing networks. Is it technically possible?*
Rohan: In the United Kingdom, where you have to change numbers, there's something like 20% churn a year anyway.

AC: *Do you expect customers to press for portability?*
Rohan: The legislation has been set that way. We have a set of numbers, about three million each.

AC: *What are the barriers to signing up digital customers?*
Rohan: There have been four major barriers. The size of the handset — but Nokia, Ericsson, Panasonic and Orbitel are coming out with small handsets now, so the size has come down. The cost is coming down too. At the beginning of this year, the cost difference for equivalent sets at the top-end was around $480. We believe the difference between analogue and digital now is much more around $240, and by the end of the year we expect it to be $75-$150, depending on the model. The cost is related to the demand for GSM sets around the world. In Germany, about 600,000 GSM sets were sold in six months last year. As I understand it, the components in a GSM set mean that it ought to be produced for the same or maybe even a lesser price in the end. Until now, the network has been subsidising our service providers for the difference between analogue and digital up, so there has been no difference to the customer.

The other two issues that have stopped people buying digital are the quality of coverage and geographic coverage. Where we have geographic coverage, our quality is excellent. We started in October in Sydney, Melbourne and Canberra and by the end of March, we're in Brisbane, Adelaide, Perth, Darwin and Hobart. Within a couple of months, we'll be in regional areas like Ballarat and Bendigo, Newcastle and Wollongong and in Queensland from the Sunshine Coast down to the Gold Coast and out to Ipswich. Our coverage by the end of the year will be excellent. Our point is that with the current drop-out rate in analogue, do you want a phone you can use every day without drop-out, or do you want a phone you can use in a place you might go to only once?

AC: *And do you expect more congestion in places like Sydney on the analogue network?*
Rohan: Yes. It's incredibly congested now. I still use it to get a view on how it's working. People phone me on it and you get drop-outs all the time.

AC: *Yet customers aren't turning to digital in droves?*
Rohan: They're starting to. I don't agree with that. I watch every day and I can see that.

AC: *Well, what are the numbers?*
Rohan: As I've said, I don't want to tell the competition. It is ramping up at a good speed and we're very happy with the response.

AC: *When will you reach a respectable number of customers?*
Rohan: It's respectable now. We are to budget, and we're very happy. But we don't want our opposition to know how we're doing.

AC: *When do you expect analogue connections to cease?*
Rohan: The key issue is the close-down date which is January 1, 2000. But a reduction of the frequency available to analogue will start in 1996.

AC: *Will congestion and the handset prices tip the balance in favour of digital?*
Rohan: Yes, the price of handsets. And as analogue starts to close down in 1996, people are not going to invest in new equipment on a congested network.

AC: *Did Vodafone get that closure written into its licence?*
Rohan: It's part of our licence. It's legislated. It wasn't so much we 'got it in.' We're paying $140 million and we're spending $600 million.

AC: *But did you ask for it?*
Rohan: It was part of the conditions of the amount we paid.

> "Under our licence we have the right to resell [analogue services]. We have decided not to do that."

AC: *So did you ask for it or did the Government offer it?*
Rohan: We would not have paid that amount if that hadn't been a condition.

AC: *So the closure is very important to you?*
Rohan: I imagine that it's very important to Optus as well.

AC: *Was $140 million too much?*
Rohan: No, not based on the conditions in the licence.

AC: *Are you worried Telstra is reportedly trying to tie up corporate customers through SPAs [Strategic Partnership Agreements]?*
Rohan: We believe we're very competitive in digital and we'll overcome that through our various service providers.

AC: *Is Orbitel, your 50% joint venture with Ericsson, going to manufacture here?*
Rohan: We're certainly trying to encourage a manufacturer to produce a digital handset in Australia. One option is that they could do it under licence to Orbitel if they wish, or they may want to develop their own.

AC: *You said you expected the price of digital phones to be close to analogue by the end of the year. Where does that put the price of a top-end handset?*
Rohan: We'd be talking of around $900, with a mid-range phone around $500.

AC: *What about the SIM cards which were one aspect of your industry development plans. Are they to be manufactured or personalised here?*
Rohan: Obviously, to start up we've had to purchase them from overseas, as the other two networks have. But we want to get them finally manufactured here and, again, we're talking to two or three people about manufacturing.

AC: *How long will that take?*
Rohan: It's up to them to commit to the capital expenditure required.

AC: *What do service providers such as Vodac say when customers ask about the much-publicised health problems?*
Rohan: I know of no evidence that there is a health problem with analogue or digital mobile phones.

AC: *There appear to be arguments for and against. Did Vodaphone, as a pioneer, do some research before GSM was introduced?*
Rohan: There is no research to show there is a problem.

AC: *Is Vodafone doing research now in response to the uncertainties?*
Rohan: I don't know what is going on in the UK in that area.

AC: *When will we see your Micro Cellular Network [MCN] which was promoted in the lead-up to the licence bid?*
Rohan: We are able to go into MCN at the appropriate time.

AC: *When will that be?*
Rohan: When the market dictates.

AC: *Isn't there a high analogue take-up now among some groups of local callers?*
Rohan: I see it about two years down the track.

AC: *What is the relationship between PCN/PCS and Vodafone's MCN?*
Rohan: It's another name for it, isn't it?

AC: *Well, that's debatable, I guess. Vodafone was promoting its MCN technology as offering low priced local services.*
Rohan: We never said that we'd have it on Day One. We obviously have to have our network spread. That's the key issue at present. It's improving every day. We're notionally national on March 31 and we're moving into regional areas in a matter of months.

Liz Fell is a freelance journalist based in Paddington (NSW).

Tom Amos

Telstra's Future — A Private Affair?

Not a day goes by now without some public talk of either telecommunications or new media opportunities like Pay TV and their effect on the way of life in Australia. What should have been the relatively painless introduction of a new type of media for public use has turned into an interminable high-drama saga that has so many facets I am sure one of the losing players will eventually make it into a mini-series. From the telecommunications perspective the manoeuvres lead directly to the question of the role of a Government Business Enterprise (GBE) and its responsibilities to its shareholder, and, ultimately, the public.

The original decision to open the marketplace to competition was tempered with a sunset clause and a five-year embargo on such competition. The reasons given were the need for a level playing field and the like, but in truth the reason could have been to optimise the value of the government's holding in Telstra.

Today we have a Telstra management that is very pro-competitively focused but, due to the regulatory restraints, is currently unable to compete, being still both dominant and sole supplier in most of the marketplace. The issue of dominance, of course, is one where Telstra really got it wrong . . . but more of that later. The question of confused messages is really now a problem. The Telstra management desperately wishes to evenly compete with Optus after shadow boxing all these years, but the legislation will not let them discount basic services. On the other hand, Telstra's competitors are fearful that, if allowed, Telstra will no doubt cross-subsidise from non-competitive areas into the areas of competition — competitors may be currently protected by legislation, but that is of little use to them if they have gone out of business.

There is only one shareholder of this Government Business Enterprise called Telstra, that shareholder being the Government itself, and so it seems that the best laid plans to increase the return will be at the potential expense of other government initiatives. In the long term we all may lose on this scenario if there is an over-supply of unused or unwanted services.

Maybe the BCS/HLS debate of some time ago underlines the dilemma in which Telstra now finds itself. The new *Act* was less than ideal when it came to defining what was a basic service and what was not, and subsequently who was dominant (an easy one) and who was not. At the time it was argued that only the very basic services in fact constituted basic carriage, and everything else was open to competition. Telstra argued the reverse, supported by Austel's black-letter law readings that in fact almost every service was basic and almost nothing was open to price competition. The non-dominant carrier is allowed to discount, whilst the dominant one is obliged to publish prices and offer them to all.

Simple stuff, but it looks as though Telstra may have really got it wrong at that time, because it is now locked into a whole range of very silly pseudo discount arrangements to try and achieve what was simply available up front if only the blinkers had been removed and the organisation had confidence in its ability to compete, which was, after all, the intent. Not a good way to optimise the return to the shareholder, and an instant way to encourage a management focus on broadening the business outside the *Act* to encompass US-style service integration.

Looking at the recent Visionstream initiative and the manoeuvres over Pay TV one would think that this is the Golden Fleece that is being dissected and distributed to the needy few, rather than a potential way to lose a lot of short-term money. Combining the infrastructure plays with the recent GBE media acquisitions underlines the broadening strategy that our GBE is now adopting.

If you look at infrastructure philosophy of Pay TV in, say, the UK, it's clear that a startling revelation has come over the industry . . . you can make serious money from selling ancillary services such as telecommunications and — surprise — switching voice and data traffic. The UK industry has moved rapidly from the doldrums of the '80s to the rejuvenation of the '90s. In addition, the gradual migration of software from free-to-air to a pay-per-view arrangement has also bolstered the once-flagging subscription industry, and now even analysts are seeing opportunities in the myriad telecom and pay services that can be carried on the basic TV infrastructure.

As with the FMO, is the Pay TV PMT pre-emptive move by Telstra an elegant way to lock out all the potential competitors in the run-up to the post-1997 freed-up market, and also lock out the potential created by the installation of infrastructure for Pay TV by the new media aspirants? The UK experience, combined with the much distorted US model, would suggest that this is more likely to be the case than any altruistic view that Telstra is just trying to help us all with a new information superhighway. In fact, this latter view could be hardly be further from the mark if the several billion dollar bill for the re-cabling Australia were to be laid at the feet of telecommunications users.

I thought we had moved on in Australia, away from monopolistic decisions on the provision of infrastructure base services towards a marketplace-based decision process, where the market effectively determines what it needs and the suppliers react accordingly. But the re-cabling thrust is just the reverse, where the supplier is at- tempting to lead the market.

Privatisation and liberalisation of the marketplace go hand in hand. One without the other creates the sort of distortions and imbalances that we are now seeing in the Australian marketplace. It may be time to either consider accelerating the pace of change to bring forward the open marketplace of 1997 — thus unshackling Telstra — or to consider a more appropriate model to measure the performance of this GBE. Whatever the outcome, the liberalisation of the full market and the GBE privatisation bullet must be bitten soon, or the conflicts will continue to erode the very basis of the deregulation thrust and lock in more of the same.

Tom Amos is a partner with telecommunications consulting engineers Amos Aked Swift.

Warwick Smith

Empowering Telecommunications Customers

The new Telecommunications Industry Ombudsman (TIO) Scheme that commenced on December 1st is already making a name for itself among consumers. The TIO Scheme is designed to enhance the industry's customer focus, promote industry development and protect the interests of small consumers in an increasingly competitive, dynamic market. The Scheme is a world first: it is mandated by legislation yet divorced from the process of government, for it is up to the industry to both fund and develop it.

Currently the TIO is averaging nearly 70 calls per day, about half of which are substantial calls on issues of common customer concern. Its constituency is primarily the small domestic or residential customer as represented by the 98% of Australian homes with a telephone; small business; rural and remote Australia; ethnic communities; the disadvantaged and the disabled. It is especially important that small customers be given a voice. The TIO's role is to help and empower customers to be positive and articulate participants in the industry. The broad function of the scheme is to receive, investigate and facilitate resolution of individual customer complaints *as a last resort.* The customer Help Desks of all carriers are well equipped to handle complaints.

The industry is increasingly customer focused, and is well aware of the opportunities of 'turning complaints into new business.' The TIO will only get involved if a complaint can not be satisfactorily settled or resolved at carrier level first. Its jurisdiction covers: basic carriage services; higher level services and eligible services; operation and directory services; fault reporting and repairing; White Pages; billing; privacy; and mobiles.

Under the TIO constitution items *not* within the jurisdiction are customer premises equipment other than the standard connection — it only covers cabling to the first phone. It does not cover Yellow Pages nor 000 Emergency services, or universal service obligation matters. Trade Practices Commission anti-competitive practices and Austel policy-type issues such as tariffing are also not covered.

It is still early days yet in terms of interpreting and analysing complaint trends and issues, but there is little doubt that mobile phones are on everyone's minds — and increasingly, in everyone's hands. About 50,000 new mobile customers signed on during last December. In March, the one million mark was reached and projections show that this figure is expected to swell to 1.3 million by the end of the year. By 1999 there will be an estimated 2.2 million analogue and digital mobile phone customers in Australia, 75% of which are expected to be digital users.

This local mobile phone phenomenon is an excellent example of a competitive market at work and as such, a good barometer of consumer sensitivity. In February, at the launch of the Australian Mobile Telecommunications Association (AMTA), I spoke briefly about this growth in mobiles, including the need for sensitivity by mobile users — or put another way, mobile etiquette and manners. As mobile phones are a relatively new occurrence, the nuances of contemporary politeness and good mobile phone manners remained uncharted waters. Such was the customer and public reaction to the mention of mobile manners that the TIO received a lot of complaints about indiscriminate or insensitive mobile use.

My small spark ignited a bonfire of response . . . mobiles were 'tinkling' at the tennis, on the golf course, in restaurants, at the theatre during a performance, at the movies, in classrooms — and even at church! Clearly there was a local need for some commonsense guidelines to encourage sensitive mobile use. The only publication I could track down was one produced by Cellnet in the United Kingdom. So, using this and the raft of issues that were raised locally, I put together a draft *Mobile Phone Etiquette for Australia* and passed it on to the carriers. Hopefully, the industry, in particular the AMTA, will use this in gently encouraging common sense and sensitive use.

No doubt this social aspect of mobiles is only part of a far broader spectrum of emerging mobile phone issues. What this mobile etiquette feedback has done, however, is to make me, and I suspect many others (especially the media), aware of the ubiquity of mobiles and how sensitive customers are to the impact of modern communications technology. The TIO Scheme encourages Alternative Dispute Resolution as an alternative to clogging the courts with litigation, and in the same spirit fostering of sensitive mobile phone use is best done via guidance and persuasion rather than regulation.

Etiquette aside, I suspect that the meteoric growth in mobiles has taken even the carriers by surprise, although I also wonder if you stopped someone in the street and asked them if they knew the difference between analogue and digital whether they would know? But increasingly they will want to know.

The recent Austel decision on dominance in the mobile market should be good for customers. Competition will be enhanced as the mobile market will now become even more competitive. Optus, with over a quarter of the analogue market, has made great strides. The decision will mean MobileNet will compete more aggressively, but all three national service providers, due to government policy, will now need to focus on the digital market. As the process of moving to digital unfolds, my office will certainly view closely the impact on customers. The proposed protective measures in Austel's decision, particularly interconnection and transparency of Telecom accounting are the centrepiece of a truly competitive mobile regime. Hopefully this major decision on dominance will work for the benefit of consumers.

There is now an industry understanding that dissatisfied customers, including mobile phone users, are powerful drivers for change. In an age of impending 'superhighways' and convergence, the customer value stream is now most important. A complaints regime, be it at carrier level or one such as the TIO's, that offers a one-stop-shop and fully meets customer frustrations is as timely as are mobile phones.

Warwick Smith is the Telecommunications Industry Ombudsman.

Finally, a hub you can wrap your whole network around.

Introducing the Lattis System 5000.™ The first network center hub.

Think of it as the hub of hubs.

SynOptics' new Lattis System 5000 is the first intelligent hub to function at the center of your network. Instead of simply connecting users together within a LAN segment, the System 5000 allows you to build a structured network, linking dozens of LAN segments to the network center. The result is the best of both worlds: the security of a central location to consolidate and manage your key resources, and the flexibility of distributed LAN segments.

The LattisSphere System.
Where hardware and software work together for a higher level of control.

Each System 5000 supports up to 52 Ethernet segments, 26 Token Rings or 28 FDDI paths, connecting tens of thousands of users. And it has a built-in migration path to future technologies like ATM and high-speed LAN switching.

Fundamental to the structured network is SynOptics' new Optivity™ software, which takes an entirely new approach to network management. With its intuitive user interface and a simple drag-and-drop operation, you can assign network devices to logical workgroups—regardless of their physical location.

To learn more about the Lattis System 5000 and SynOptics' new LattisSphere™ System, call Australia 1800 81 7070 or New Zealand 0800 44 7070. We'll be happy to send you the complete wrap-up.

SynOptics

The Network Fabric of Computing

© 1994 SynOptics Communications, Inc. Lattis System 5000, LattisSphere and Optivity are trademarks of SynOptics Communications, Inc.

CALL AUSTRALIA 1800 81 7070 or NEW ZEALAND 0800 44 7070.

The Great Asia-Pacific Space Crush

A scramble to launch satellites in the Asia-Pacific orbital arc is the prelude to a competitive services market offering lower tariffs for customers and a bonanza for equipment suppliers.

Backed by national governments, upstart entrepreneurs and large multinationals are racing each other to access the unplanned Asia-Pacific geosynchronous orbital slots and spectrum assigned to fixed satellite services (FSS). From this orbit, approximately 36,000km above the equator, satellites can 'see' a section on earth for 24 hours a day. Others in lower earth orbits, known as LEOs, may offer a longer-term mobile solution. Right now, the race is between the GEOs.

A powerful and sophisticated Pacific satellite operated by PanAmSat is scheduled for launch in May. This is only the first. By the end of next year, Australia will be 'seen' by a host of new spacecraft launched to GEO slots claimed by the US, China/Hong Kong, Japan, Indonesia, Russia and Tonga. Others are planning to follow, or to get there first. With beams of varying size, shape and power using both the Ku and C frequency bands, the regional operators will offer a range of voice, data and video services. PanAmSat's Pacific (PAS-2) bird, for instance, offers connectivity across the region from Australia/New Zealand to mainland Asia and the US west coast. It also has a switchable spot beam for Australia/NZ which looks very similar to the Optus B1 beam.

The arrival of competitive regional/international satellites signals the end of an era when the PTT shareholders of Intelsat, the 130-member global satellite consortium, could on-sell capacity and services to customers at mark-ups reported to be as high as 200-300%. Where permitted, private operators such as PanAmSat plan to offer direct access to capacity without these mark-ups. Australian customers seeking connectivity to and from other countries will benefit. Within Australia, however, customers may have to secure their satellite services through Optus or Telstra unless PanAmSat gains an exemption (see 'Regulatory Restraints' on page 70).

An early chance for Optus (then Aussat) to gain a lead in the regional race was lost in 1990 when the Government, for commercial and political reasons, knocked back a plan to modify Aussat's first B series satellite. A senior engineer from the US manufacturer, Hughes Aircraft, explained at the time that he had actually commenced work on designing a 'PacRim' beam covering east Asia from Japan to Indonesia, with a squirt to Hawaii. The failed launch of Optus B2 offered another chance to modify the new B3 due this year, but no changes are planned.

Australia, on behalf of Optus, has four slots using Ku Band frequencies registered with the International Telecommunication Union (ITU). It filed another claim last year for a GEO slot at 151.5°E for a digital audio broadcasting (DAB) system. Dubbed DBStar, this light satellite uses newly assigned L Band (1,452-1,492MHz) frequencies. No details have been released by the ITU or the Government on the DBStar design or how it will be financed. It appears similar in concept to the DAB system on Indonesia's Indostar lightsats and will need to operate in different channels to avoid technical interference. David Soothill, head of ABC Technology Strategy, said the public broadcaster had done "some work on the concept," but he stressed that it was not an ABC system.

Regulatory Restraints

As the first private competitor for Intelsat, PanAmSat has fought to win 'landing rights' in Europe and Latin America for the PAS-1 Atlantic Ocean satellite. Now the struggle has moved to Australia where Optus has a de facto domestic satellite monopoly guaranteed by the *Telecommunications Act* until mid-1997.

Under Section 92, general carriers have reserved rights to supply domestic satellite-based facilities defined as facilities in a satellite. Section 103, however, allows PanAmSat, or any other non-carrier satellite operator, to supply international capacity directly to customers.

The regulatory situation is complex, as those who have tried to decipher the language in Section 92 (3) would know, but there appears to be general agreement that:

- All satellite capacity for use within Australia must be obtained from or through Telstra/Optus; and
- Satellite capacity for international services to and from Australia *may* be supplied by a non-carrier provided the service provider holds a licence to operate a prescribed earth station under the *Radiocommunications Act*.

The service providers using non-carrier facilities must also abide by special conditions in Austel's International Service Providers Class Licence. These limit services to own use (no resale) or single-ended interconnect i.e. interconnection of a service with a public network, or intended for the general public, at only one end of the link.

According to potential PanAmSat customers, the domestic price will necessarily be higher if the capacity must be bought through a carrier. Further, the PAS-2 satellite is custom-designed for hybrid domestic/regional services that neither general carrier can currently deliver through Optus or Intelsat satellites.

The domestic/international regulatory partition would appear to affect hubbing customers, for instance. To access PAS-2 for a private Asian-Pacific VSAT mesh network with both Brisbane and Sydney terminals, these customers would have to buy domestic capacity through Telstra/Optus and international capacity through PanAmSat!

PanAmSat last September asked the then Communications Minister for an exemption to enable PAS-2 to supply private domestic networks (data services, private lines, VSATs, data broadcasting and digital voice) and to distribute domestic TV and radio services.

Under Section 106, the Minister can direct Austel to authorise services, after consultation with Telstra and Optus, 'only if they do not erode unduly the practical value' of the carriers' rights. The Minister could implement this exemption by varying the Telecommunications (Authorised Facilities) Direction 1/91. Consultation was still in progress at press time.

PanAmSat is not seeking an exemption to supply the satellite Pay TV broadcasters, another Optus monopoly under the *Broadcasting Services Act*. But a burgeoning group of Pay TV narrowcasters is pressing for domestic competition to distribute programs between MDS sites, according to Barney Blundell, chairman of the Federation of Narrowcaster and Subscription Services.

Liz Fell

Regional Growth Markets

Fuelled by high growth rates, a lack of adequate terrestrial infrastructure and the arrival of competitive telecoms operators and multichannel TV providers, Asia-Pacific markets for satellite services and equipment have taken off.

Business is booming for General Motors Hughes, which has sold its HS 376 and HS 601 satellite models to regional operators from the US, Japan, Thailand, China and Indonesia. Other US-based manufacturers — Martin Marietta Astro Space and Space Systems/Loral — are also benefiting from the expanding regional market. Given these US systems cost about $US200 million for a medium to large satellite plus launch, it is not surprising that some entrepreneurs are looking to Russia for smaller light satellite models with a lower price-tag and shorter life-time.

Everyone agrees there is enough pent-up demand for multiple competing systems in the region. Future capacity is difficult to predict, given speculative ITU filings. Further, segmentation into 'international,' 'regional' or 'national' categories is far too crude for this changing environment. Most new systems are designed to cover and connect national and regional markets using switchable beams and varying bandwidths.

In the Pacific Ocean Region, PanAmSat forecasts annual 1992-98 growth rate in transponder demand for broadcast TV at 10%; for business communications at 15%; and for telephony at 2%, and estimates total annual growth rate in transponder demand at 10%. Another Asia-Pacific study by Arianespace projects that transponder demand will grow to some 800 (36MHz equivalent) units early next century from about 200 in 1992.

Based on in-house research, Karl Rossiter, TVNZ Business Development Manager, predicts that 79 commercial satellites will service the region by 2000, with more than 500 transponders suitable for TV. TVNZ is a major customer with two regional leases on Indonesia's Palapa-B2P and three trans-oceanic Intelsat leases, where it uses digital video compression (DVC). With a DVC rate of 4:1, Rossiter says 500 transponders translate to more than 2,200 TV channels. And some technologists are talking of an 8:1 compression rate or better!

As DVC technology reduces demand for wideband capacity and lowers prices, the overall TV/video market is expanding. Niche regional programmers have emerged such Asia Business News (a TVNZ joint venture) and global suppliers such as Time Warner's Home Box Office (HBO) are designing multiple program networks for specific time zones and language groups. These programmers are racing to book capacity on what they hope will become Asia's 'hot birds' i.e. satellites that have most antennas pointed at them because they carry attractive program packages.

The demand for corporate and public voice and data services in developing markets such as China, the Philippines and Indonesia is underscored by the proliferation of VSAT networks. These countries have turned into new battlegrounds for North American suppliers. In Australia and New Zealand, where private VSAT networks have never taken off, companies such as Scientific-Atlanta (S-A) expect the market to expand. Steve Dean from S-A Australia is now promoting a new fourth generation Sky Relay system for super-broadband LAN applications which he claims is competitive with terrestrial systems. Other growth areas for equipment suppliers include earth stations, teleports, satellite news gathering equipment, multiplexers, transceivers and modems.

North Australian coverage by Indonesia's Palapa-B2P satellite has already stimulated S-A's local business. In Darwin, it has built an antenna for the ABC's Australia TV. With the ABC now booking capacity on the Apstar hot birds and PanAmSat planning a teleport in Australia, new opportunities are unfolding.

Mindful of the changing market, the ABC asked S-A to build its new Optus earth stations in each capital city so they could be modified easily for PanAmSat, Intelsat or others. According to the ABC's David Soothill: "PanAmSat is good competition for Optus with comparable performance and probably better prices. We are are looking at all the options all the time." The Nine Network is watching carefully too. It operates Intelsat and Optus earth stations as well as a Palapa antenna in Darwin. The Darwin facility, built originally by Telstra, is used by Nine to transmit TV feeds such as World Television News across the region, but other services are planned.

The Telstra Board last year finally approved a joint venture agreement for the company to share in the development and marketing of satellite technologies such as earth terminals in China and the region. The agreement is with the Chinese Academy of Space Technology (CAST) which builds satellites as well as earth station terminals. CAST's parent, the Aerospace Corp., has a stake in the private Apstar satellite system which will beam into Australia. Through the design, construction and operation of Intelsat earth stations in Australia and Indochina, Telstra and its suppliers have earned an international reputation in this market.

Intelsat's own ambitious program to compete with a fleet of ten new spacecraft has seen Queensland company Mitec win a contract with one of Intelsat's US-based manufacturers. Two new Intelsat VIII satellites built by Martin Marietta Astro Space will carry flight equipment designed and manufactured by Mitec.

Optical fibre cable networks are carrying more and more of Intelsat's international telephone traffic so executives hope this loss will be balanced by growth in demand from developing regions, from TV/video and from VSAT networks. Fibre is proliferating on thick routes across the region, but satellites are expected to remain the least expensive point-to-multipoint distribution technology with the capability of servicing thin route and remote areas. With telephone traffic growing by 25% a year in a region where the ITU estimates that countries have on average four phones per 100 population, there will be demand for both distribution technologies, as well as the new mobilesats.

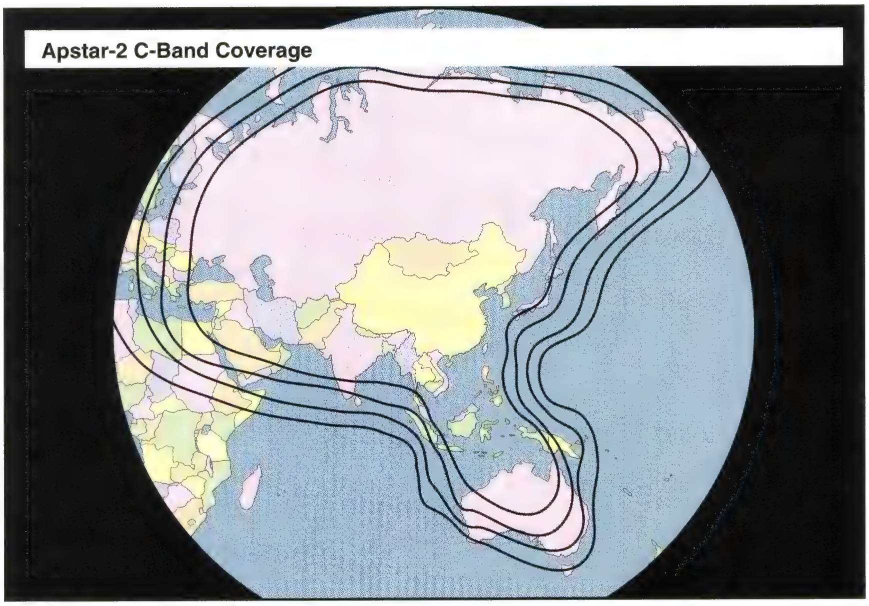
The US Satellite Leaders

PanAmSat has raised $US640 million during the last 18 months to finance four new customised HS 601 satellites. Executives claim that pre-launch agreements, together with long-term commitments going forward on the existing Atlantic PAS-1 satellite, are now at $US1.2 billion. Global coverage will arrive in March/May next year with the launch of PAS-4 covering the Indian Ocean region.

The target market for PanAmSat is the burgeoning TV program business in Asia and the US. Through PAS-2, the company can deliver programs directly to TV operators or households in Australia using 60-90 centimetre antennas. Another target is corporates seeking private voice and data networks using 0.9-1.8 metre Ku Band antennas at multiple sites. PAS-2 has the flexibility for seven transponders to focus on Australia/New Zealand or to switch to other countries such as China. PanAmSat's decision to establish its Asian office in Sydney is evidence of its interest in Australian and NZ customers.

Addressing the PTC'94 conference in January, CEO Fred Landman reminded the audience that PanAmSat was regarded as an "upstart" less than 10 years ago with "myriad regulatory and market hurdles." Rene Anselmo, who once ran a Spanish language program network in the US, founded the company using private funds. He retains control after selling 50% to former program partner, Emilio Azcarraga from Mexico's giant TV group, Televisa. Another $US440 million was raised through a bond offer that sold out on Day One.

Apstar-2 C-Band Coverage



Anselmo has waged a long and colourful battle against Intelsat and its major shareholder, Comsat. When a US court threw out an antitrust suit charging that Comsat had tried to stifle competition using predatory pricing and other practices, the 'upstart' pressed on. The court had argued Comsat was protected in its role as Intelsat's representative, so PanAmSat re-charged Comsat as a corporate entity.

PanAmSat this year moved to join 15 more telcos to the suit charging that they conspired with Comsat and among themselves to monopolise international telecoms satellite services. As part of this move, it alleges that BT, France Telecom, Deutsche Telekom and Telefonica conspired to acquire and jointly market transponders on competing satellites and to fix prices. Said Anselmo: "If we did not face the anti-competitive conspiracy that we have now unmasked, PanAmSat would have been able to expand its system years ago."

Intelsat, with estimated revenues of $US666 million last year and a fleet of 20 satellites, has offered transoceanic, regional and domestic services since 1976 to the Asia-Pacific. Partly because usage was relatively low, Intelsat's policy has been to design spacecraft for the Atlantic and Indian Oceans and then move them to the Pacific. Indeed, in recent years, the Pacific has been serviced by mainly 'end-of-life' inclined orbit spacecraft. But with Pacific traffic growth reaching as high as 20% during the 1980s, and competition on the horizon, this is changing. The first satellite designed for the region commenced service in January. According to Dr Eui Koh, Intelsat's Asia-Pacific director, at least nine new sophisticated long-life spacecraft are slated for the region during the next three years.

To address this demand, Intelsat has created a new landmass service area, the Asia-Pacific Region (APR). The aim is to enhance connectivity from Japan, Australia and the Pacific islands to central and eastern Europe and east Africa. An 'end-of-life' satellite is over the APR already, and a small Russian-built Ekspress is slated for launch this year over the Asian landmass rather than the ocean.

In its haste to maintain a lead in the regional market, Intelsat has adopted an aggressive range of strategies: new satellites, a new landmass service area, a flood of orbital filings with the ITU, and direct marketing to customers, where permitted. Perhaps the most unusual strategy is the proposed financial deals with China which would see China's Ministry of Posts and Telecoms (MPT) providing a plum orbital slot for an Intelsat bird. As PanAmSat executives, among others, have pointed out, Intelsat's own strategies are beginning to resemble those it has denounced when they were used by newcomers such as Tongasat!

Another Intelsat competitor, Columbia Communications of the US, has started servicing the north Pacific/Atlantic routes in a revenue share deal where it uses capacity on NASA's Tracking and Data Relay Satellite System (TDRSS). One Australian-based customer is considering carriage of traffic through the PacRimEast optical fibre system to Guam and then uplinking through the Columbia/TDRSS Pacific satellite.

Continued on page 74

Asia-Pacific Private Satellite Systems

COUNTRY	OPERATOR	SATELLITE SYSTEM	ORBITAL SLOT (EAST LONGITUDE)	LAUNCH DATE
UNITED STATES	**PanAmSat Asia Pty Ltd.** 1 Macquarie Place, Sydney 2000 Australia	PAS-2	169°	1994
	PanAmSat LP One Pacific Plaza Greenwich CT 06830 USA	PAS-4	68/72°	1995
UNITED STATES	**Columbia Communications Corporation** 1088 Bishop Street, Suite 2912, Honolulu, Hawaii 96813	TDRSS-5	174.3°	In service 1992
UNITED STATES	**TRW Inc.** TRW Space and Electronics Group, One Space Park, Redonda Beach, California, 90278	PacifiCom-1	172°	Not announced
CHINA	**APT Satellite Co. Ltd.** Room 3111-2, 31st Floor, One Pacific Plaza, 88 Queensway, Hong Kong	Apstar-1	131°	1994
		Apstar-2	85 - 90°	1994-95
HONG KONG/UK	**Asia Satellite Telecommunications Co.** 23-24 F, East Exchange Tower 38-40, Leighton Road, Hong Kong	AsiaSat-1	105.5°	In service 1990
		AsiaSat-2	100.5°	1995
JAPAN	**Japan Satellite Systems Inc. (JSAT)** Shiroyama JT Mari Building, 27F, 4-3-1, Toranamon, Minato-ku, Tokyo 105 Japan	JCSAT-3	128°	1995
INDONESIA	**PT Satellite Palapa Indonesia (Satelindo)** Mulia Centre, Suite 1201, Jalan H.R. Rasuna, Said Kav. X6, No. 8, Jakarta 12940 Indonesia	Palapa-C1	113°	1995
		Palapa-C2	108°	1996
		Palapa-C3	118°	1998
INDONESIA	**PT Pasific Satelit Nusantara (PSN)** Mulia Centre, Suite 1201, Jalan H.R. Rasuna, Said Kav. X6, No. 8, Jakarta 12940, Indonesia	Palapa Pacific-1	134°	In service 1992
THAILAND	**Shiniwatra Satellite Co. Ltd.** 41/103 Rattanathibet Road, Nonthaburi 11000 Thailand	Thaicom-1	78.5°	In service 1993
		Thaicom-2	78.5°	1994
MALAYSIA	**Binariang Sdn. Bhd.** 2nd Floor, 11 Jalan Tandang, 46050 Petaling Jaya, Selangor Darul Ehsan, Malaysia	Measat-1	91.5/95.0°	Not announced
RUSSIA	**Global Information Systems (Moscow)** **GloboStar Satellite Systems Ltd (HK)** 1408 Prince Building, 10 Charter Road, Central, Hong Kong	GloboStar-1	55°	1994
		GloboStar-3	86.5/91.75°	Not announced
RUSSIA	**SovCanStar Satellite Communications Inc** C/- Mercury Lrd, Miusskaya Square 3, Moscow, Russian Federation	SovCanStar-1	145°	Failed 1993
PNG	**Pacific Satellite Inc.** P.O. Box 1349, Boroko, NCD, PNG	Pacstar-1	167.45°	Not announced
TONGA	**Rimsat Ltd.** 1911 Production Road, Fort Wayne, Indiana 46808 USA	Tongastar-1 (G)	134°	In service 1993
		Rimsat-1 (G)	130°	In service 1993
		Rimsat-2 (G)	142.5°	1994
		Rimsat-3 (E)	134°	1994
TONGA	**Unicom Satellite Corp.** P.O. Box 3057, Aspen, Colorado, 81611, USA	Unicom-1	170.75°	Not announced
		Unicom-2	138°	Not announced

Geosynchronous Fixed Satellite Services

TRANSPONDERS AND BANDWIDTH	EIRP (MAX dBW)	COVERAGE AREA	COMMENTS
PAS-2 C Band: 16 x 54MHz Ku Band: 16 x 54Mhz	C - 38 Ku - 52	PAS-2 has trans-Pacific, regional and domestic connectivity in the Asia-Pacific. There is a switchable Ku spot beam service over Australia/NZ	PanAmSat will offer global connectivity in 1995 through PAS-3 over the Atlantic Ocean and PAS-4 in the Indian Ocean
PAS4: Additional Ku 8 x 54MHz	As above	PAS-4 covers the Indian Ocean region from Europe to Japan and south to Australia	
C Band: 12 x 36MHz	C - 36	North Pacific from the Philippines to China, Japan, Russian Far East and the US West Coast	Columbia has overlapping TDRSS capacity over the Atlantic allowing it to offer services from Asia to Europe
C Band: 2x 36MHz; 5 x 45MHz; 1 x 72MHz; Ku Band: 4 x 27MHz; 2 x 54MHz; 5 x 72MHZ	C - 37.7 Ku - 56.5	US West Coast to Asia and the South Pacific (including Australia and New Zealand)	Two co-located satellites planned; TRW is marketing Columbia services
Apstar-1 - C Band: 20 x 36MHz; 4 x 72MHz	C - 35	Coverage of Japan, China, and much of South East Asia to northern Australia	Claims to be fully booked
Apstar-2 - C Band: 24 x 36MHz; 2 x 64MHz Ku Band: 8 x 54MHz	C - 37 Ku - 45	There is one powerful C Band beam covering all of Asia, the Middle East, parts of Europe, Africa and Australia	Claims to be nearly fully booked. Orbital slot not yet known. The ABC has reserved capacity on Apstar-1 and will migrate to to Apstar-2 in April 1995
AsiaSat-1- C Band: 24 x 36MHz	C - 37	The northern footprint covers China and North East Asia; The southern footprint covers South and South East Asia from Pakistan to Vietnam	Claims to be fully booked
AsiaSat-2 - C Band: 20 x 36MHz; 4 x 72MHz Ku Band: 9 x 54MHz	C - 40 Ku - 53	Ku band coverage of North Asia. One high powered C Band beam reaches from Turkey to Tokyo and the CIS to Australia, similar to Apstar-2	Claims to be nearly fully booked
C Band: 12 x 36MHz; Ku Band: 4 x 72MHz; 12 x 36MHz	Ku - 55 C - 46	All of Asia from India to Russia; Australia/New Zealand Ku Band, and Hawaii in the east	Marketing aggressively around the region, including in Australia
C Band: 24 x 36MHz; 6 x 36MHz Ku Band: 4 x 72MHz	C - 37 Ku - 50	Has two C Band coverage areas; one reaches from southern China to eastern Australia and NZ	The state-owned PT Telekom operates the existing Palapa-B2P, Palapa-B2R, and Palapa-B4 which are due to cease service in 1995, 1998 and 2003. Satelindo's Palapa-C extends the size, reach and coverage of the B series
C Band: 24 x 36MHz	C - 38	East Asia to Hawaii, including Micronesia	Uses the ageing inclined orbit Palapa-B1. Agreement to consider new satellites and slots with Tonga
C Band: 10 x 36MHz Ku Band: 2 x 54MHz	C - 39.5 Ku - 54	Thailand, Japan, Korea, China (part), Indochina, Malaysia and Indonesia	Co-located satellites
As above	As above	Extends south to cover all Malaysia and Philippines with spot beam to Europe	
Not announced	Not announced	Coverage of East Asia group of countries including the Philippines and southern China	Manufacturing contract running late
C Band: 16 x 36MHz	Adjustable, C - 50	Coverage of Europe, Africa and nearly all of Asia, including western Australia	With GloboStar 2, the three Coupon satellites with offer almost global coverage
May be hybrid C and Ku	As above	Expands coverage to Japan and Australia	Searching for another mid-Pacific slot for Globostar-3
Gorizont - C Band: 6 x 36MHz Ku Band: 1 x36MHz	Not announced	Global, hemi, zonal and spot beams have Australian coverage	Failed Proton launch last year. Planning up to five satellites covering Asia-Pacific, Europe and CIS
C Band: 18 x 36MHz Ku Band: 6 x 72MHz	C - 40 Ku - 55	From Japan to the US West Coast with spot beams for ASEAN, Oceania (including Australia) and the US	PSI's priority on this slot expires in June. It has reapplied to the ITU. PanAmSat is planning to launch at 169°
Gorizont — C Band: 6 x 36MHz; Ku Band: 1 x 36MHz Ekspress — C Band: 9 x 36MHz, 1 X 40MHz; Ku Band: 2 x 36MHz	Gorizont C - Global 27.5, spot 46, Ku - 38.5; Ekspress C - Global 27.5, hemi 29.5, zone 45, Ku - 38.5	From Iran to China and south to Australia and New Zealand, east to Hawaii. Has global, zonal, hemi and spot beams	Rimsat will launch three more Ekspress in 1995-96
C Band: 12 x 36MHz Ku Band: 6 x 72MHz	C - 36 Ku - 50	Connects the entire Pacific Rim from Japan to the US West Coast and south to Australia and New Zealand	Unicom has had trouble with finance and options to lease Tongan slots may run out at some stage. Tonga has filed slots with the ITU at 70°, 83.3°, 130°, 134°, 138°, 142.5° and 170.75°
Not announced	Not announced	Covers Asia and extends to Hawaii	

From page 71

TRW Inc., the space and defence manufacturer, which is marketing services for Columbia, has received conditional authorisation for a satellite system known as PacifiCom. However, it continues to refuse to comment on any plans for this system. Press reports suggest TRW interest is focused on manufacturing the first telecoms/research satellite for Taiwan for launch in 1997. Taiwan is planning to have three of its own spacecraft in orbit by 2006.

Chinese Strategies

Three new satellite ventures should see the People's Republic of China by 1997 controlling the orbital slots and frequencies for three different regional systems that can 'see' Australia.

The proposed joint venture between China's MPT and Intelsat would enable the Chinese Government to own nearly 50% of a new Intelsat spacecraft and to use about 75% of capacity. This Intelsat 805, to be positioned in an orbital slot registered by China, is scheduled for late 1996.

Chinese customers will also lease capacity from two private operators planning to launch three pan-Asian birds within the next 12 months. First up this year in Chinese-owned slots should be APT Satellite Co.'s Apstar-1 and Apstar-2. Following close behind early next year is a new AsiaSat-2. AsiaSat's frequencies and orbital slots, currently licenced in Hong Kong and registered by the United Kingdom, will fall under the control of the PRC in 1997.

Apstar owners include companies representing the Chinese Ministries of Posts and Telecoms, Aerospace, and the Commission of Science, Technology and Industry for National Defence. Overseas Chinese investors comprise Thailand's CP Pokphand Group, companies from Taiwan and Macau, and Singapore Telecom.

APT executives claim that Apstar-1, which will beam into north Australia, is fully reserved by regional TV programmers and China's MPT. Transponder leases cost a reported $US1.1-1.3 million, which is competitive with both Indonesia's Palapa and AsiaSat. Executives claim also that Apstar-2, which has a pan-Asian beam reaching across the Australian mainland, will be fully pre-booked before take-off.

APT Satellite Co.'s rival, Asia Satellite Telecommunications Co., is owned equally by China International Trust and Investment Corp. (CITIC), C&W of the UK and Hutchison Whampoa of Hong Kong. Having established the first pan-Asian satellite, the company plans to launch AsiaSat-2 with a beam similar to Apstar-2 covering 66% of the world's population. AsiaSat-1 is operating at full capacity, with half the transponders occupied by Star TV, now controlled by News Corp. Provided Star TV leases at least six more AsiaSat transponders, it will also have exclusive rights to broadcast regional TV on AsiaSat-2.

Ironically, it was frustration at Star TV's exclusive rights on AsiaSat that led another powerful group of programmers to back Apstar. At a ceremony held in Hong Kong in December last year, News Corp. executives from Australia's PMT consortium and Hong Kong's Star TV watched quietly as a 'Gang of Seven' regional programmers staged an unprecedented degree of cooperation, signing multi-million dollar deals for nearly half the Apstar-2 transponders.

With Star TV surveys claiming the five-channel service can be received by 30.5 million mainland homes, China has moved swiftly to manage this flood of foreign satellite programming. Taking the lead from countries such as Singapore, China appears to have adopted a three-pronged strategy: tighten controls on home TV antennas; licence multichannel cable operators to redistribute satellite program feeds; and expand the number and reach of programs delivered by Central China TV (CCTV) and provincial stations. At the recent Asia-Pacific Satellite Summit, Prof. Wei Xuexing from the PRC Satellite User's Association forecast 20-30 national satellite TV channels and at least one million ground stations for terrestrial redistribution by the year 2000.

The VSAT market in China is also booming, with an estimated 4,000 terminals installed already. Using AsiaSat-1, the MPT provides public switched voice and low rate data services in Tibet through a Hughes Network Systems (HNS) full mesh digital VSAT network with Demand Assignment Multiple Access (DAMA).

The Slot Congestion Problem

The privatisation of international satellite supply has been accompanied by a trend towards viewing the geostationary orbit and frequency spectrum as goods with monetary value rather than as public resources for national governments.

At a PTC'94 session on Asia-Pacific orbital congestion, these marketplace concerns were reflected in accusations of 'speculation,' 'squatting' and 'trafficking' as operators staked out claims for identical or dangerously close slots. Those operators at the session expressed anxiety that the increasing numbers of claims lodged with the ITU, combined with hogging, squatting and parking 'end-of-life' birds in scarce slots, were creating an uncertain investment environment. Reflecting similar customer concerns, TVNZ's Karl Rossiter coined the slogan 'Buyers Beware' to highlight the potential revenue loss if their services faced interference or signal degradation from 'rogue' satellites.

Tongasat is the main target for 'trafficking' accusations by competitive US operators. Columbia, supported by PanAmSat, petitioned the FCC last year to deny US 'landing rights' to Rimsat/Tongasat. In Columbia's view, it is fundamental to the ITU framework that 'no entity or nation may lay claim to the orbit/spectrum resource as a commodity that can be warehoused or traded for pecuniary gain.' At the PTC'94 session, PanAmSat executive, Greg Daffner, focused attention on this issue when he flashed up a slide reading: 'Slots for Sale? Call 1-800-Tonga.' After denouncing 'flim-flam cowboy operations' for disrupting ITU procedures, he declared: "It's trafficking — registering for orbital slots with no plan to use the slot other than to find the highest bidder."

Tongasat's then Managing Director, Matt Nilson, replied that nominal licence fees may have been appropriate in the public service paradigm, but could not be justified in a market-oriented approach. Hence, Rimsat pays Tongasat an annual licence fee based on the commercial value of using the orbital position. Nilson also pointed to the potential anti-competitive nature of these accusations given PanAmSat and Columbia are up against Tonga's operators. Said Rimsat's Michael Sternberg: "Tonga wasn't the first country to commercialise slots. Whether you give the slot away and collect taxes on the company that you're giving the slot to, it's still commercialisation."

The three-hour discussion at PTC'94 highlighted the increasing pressures on the ITU's regulatory framework as cut-throat multinatonal competition takes over from the spirit of inter-governmental cooperation.

The ITU radio regulations, which have international treaty status, specify lengthy procedures that member nations/operators must follow before registering orbit/spectrum for satellite networks. Based roughly on 'first-filed, first-registered' principles, the aim is to guarantee protection from interference by newcomers.

But as the PTC'94 session indicated, plenty of loopholes exist in the 1,500-page rule book. Commenting on the debate, ITU chief, Pekka Tarjanne noted the absence of "real fights" and "harsh criticism" of the ITU. Accepting that new technical methods and some changes may be needed, he defended the regulations as "in general" working well. "To talk about congestion is to exaggerate the current situation," he added.

Liz Fell

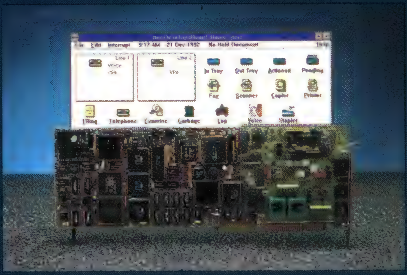
Jtec

Solutions

Networking Multiplexers
for
Voice
Data
Video *and*
ISDN Applications

A complete family
including support for
smaller sites

Data only applications
supported by
Advanced ISDN
Terminal Adaptors



Intelligent PC
Add In cards for
Advanced DeskTop
Applications

Comprehensive yet
affordable
Network Management

Head Office
Jtec Pty Limited
ACN 003 169 088
Unit 3
118 - 122 Bowden St
Meadowbank 2114
NSW Australia

Phone

International	612-809-6933
Sydney	02-809-6933
Melbourne	03-263-0200
Canberra	06-253-3399
Brisbane	07-229-9233
Europe	44-494-47-3757

Fax

International	612-809-6619
Sydney	02-809-6619
Melbourne	03-263-0215
Canberra	06-201-3003
Brisbane	07-363-0023
Europe	44-494-53-6254

Japan Catches Up

The Japanese Research Institute of Telecommunications and Economics (RITE) in 1983 released a design for a 'separate' Pacific region satellite system. The then Intelsat chief, Richard Colino, under pressure from private US companies seeking to compete in the international market, responded angrily. The US adopted an international 'open skies' policy in 1984: Japan waited another ten years until the recent recession served as a catalyst. After pressure from loss-making domestic satellite carriers, the Government is now moving to allow these carriers to compete in the international market.

Japan Satellite Systems Inc. (JSAT) moved swiftly to announce a new regional satellite last year before the regulatory structure was in place. JSAT plans to launch a HS 601 satellite in August 1995 with multiple beam coverage and connectivity from India and Russia to Australia/NZ and Hawaii. An Oceania spot beam is designed to cover Australia and NZ in Ku Band. Known as JCSAT-3, this satellite will join two domsats owned by JSAT, which was set up last year from a merger of two satellite carrier companies. JSAT has four large shareholders: Itochu (28.5%), Mitsui (24.5%), Sumitomo (23.5%) and Nissho Iwai (23.5%).

Space Communications Corp. (SCC), another loss-making domsat carrier that operates two Superbirds, is controlled by Mitsubishi. Takanori Mochizuki from Mitsubishi Electric's Space and Satellite Department has confirmed that SCC also is aiming at the international market. He said the company was talking with US-based Orion Network Systems, which is launching satellites over the Atlantic before the Pacific.

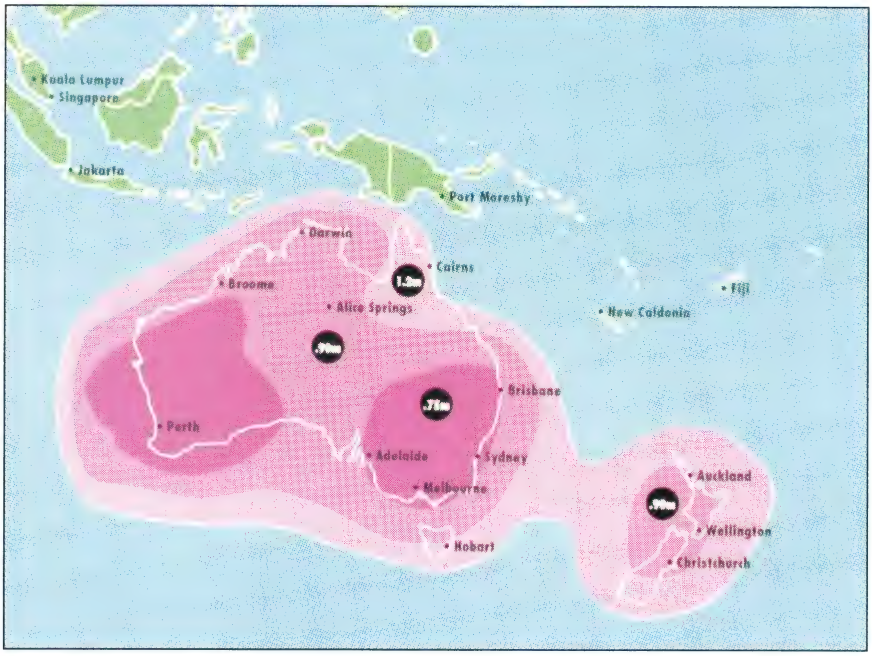
The ASEAN Group

Indonesia has privatised its new satellite system and has two ventures scheduled to come on-stream in about 18 months. A Hughes HS 601 Palapa-C satellite will offer expanded regional coverage embracing east Australia, and the first IndoStar lightsat will beam direct-to-home TV and digital audio broadcasts across the nation.

Since the launch of the first Palapa in 1976, Indonesia has forged a successful regional system servicing customers in Thailand, the Philippines, Malaysia, Cambodia, Vietnam and PNG. More recently, it has created a 'hot bird' for powerful regional TV programmers. Australian households in the north, and others in the Palapa-B2P footprint, can pick up 16 or more unencrypted channels with a 2-3.6 metre antenna/receiver costing $US1,000 upwards.

With Thailand, Malaysia and the Philippines either entering or planning to enter the satellite services business, and Singapore filing for six orbital slots with the ITU, Palapa faces a fragmented market and loss of business. Even its foreign program customers are reserving capacity on other 'hot bird' options such as Apstar. To address this competitive market, the Indonesians have adopted several new strategies including private sector ownership, expanded coverage for a new $US128 million Palapa-C system, cheaper transponders and improved marketing and service.

The Palapa privatisation has seen the entry of the Bimantara conglomerate to the telecoms sector. Headed by President Suharto's second son, Bimantara has interests in TV and equipment manufacture. Now it has a 60% share in an alternative carrier, PT Satelindo, with the remainder held by state-owned PT Telkom and PT Indosat. Satelindo has licences to operate the Palapa C system, cellular mobile and international network systems.



Scheduled to be launched this year, PanAmSat's PAS-2 satellite will cover much of the Asia-Pacific region and include a switchable Ku Band spot beam for Australia and New Zealand

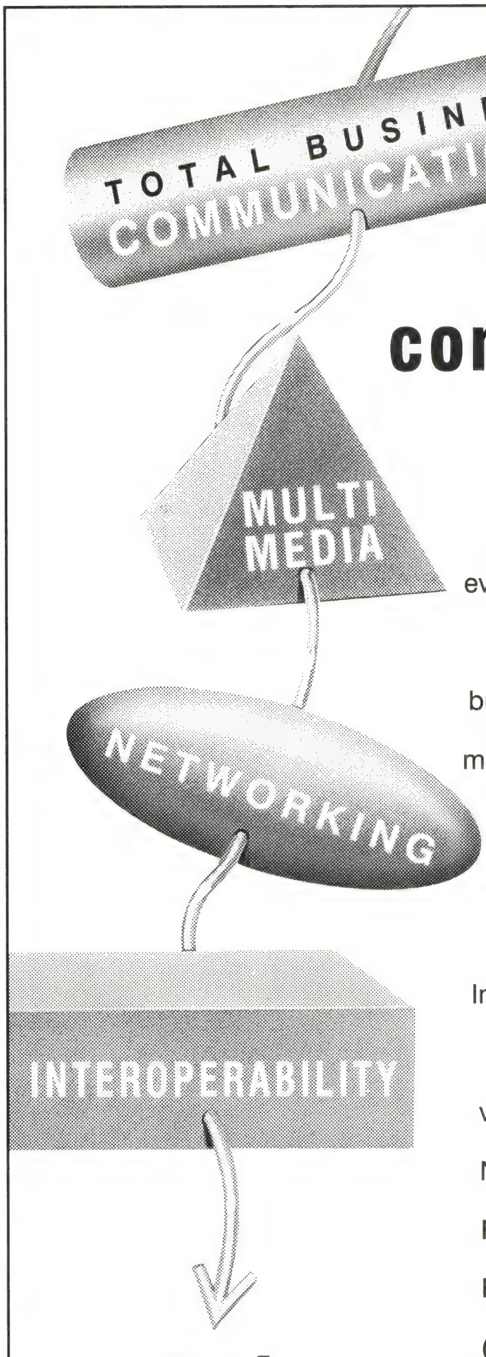
The Bimantara group also has a stake in two other satellite ventures: PT Pasific Satelit Nusantara (PSN), a company offering regional services on the 'end-of-life' Palapa-B1; and IndoStar, a $US150 million joint venture with US manufacturer, International Technologies. IndoStar will provide compressed digital and analogue TV channels in S Band (2,520-2,670MHz) as well as radio channels in L Band. Nationwide TV reception will be via existing sets with a 'low cost receiver' and one metre antenna.

Another vertically integrated conglomerate with interests in TV, telecoms and satellite has emerged in Thailand under Dr Thaksin Shinawatra. In December, Shinawatra Satellite Co. launched Thaicom-1, and Thaicom-2 is due this year. These satellites will service Thailand and the east Asian region, including Indochina where Shinawatra has a foothold in telecoms and TV. Under the terms of the 30-year Build Operate Transfer (BOT) contract with the Thai Government, Shinawatra has an eight-year monopoly on satellite services within Thailand. This affects existing Palapa users including VSAT operators such as Compunet, Acumen, Thai Skycom and Samart Telecoms (a Telstra joint venture).

In the Philippines, industry and government are developing a framework for a possible domestic satellite system or for participation in a consortium with neighbouring countries. An Intelsat study has projected that satellite use will increase from the present 6.5 transponders on Palapa to about 12 in 2006. Through an early partnership with the Benpres conglomerate in VSAT operator, International Communications Corp., Telstra is poised to take advantage of the deregulated long-distance market.

Addressing the recent IIR Asia-Pacific Summit, consultant Alfredo Panzales outlined the Philippine satellite concept as a BOT scheme for two 12-transponder spacecraft costing $US200 million; with paid up capital of $US30 million, with the rest sourced from a bilateral lending institution; and with ownership to be 60% Filipino and 40% foreign, with listing on the local exchange. Panzales said Shinawatra and interests associated with Koreasat each had provided a proposal, with Intelsat offering "a bridging solution."

Plans for a Malaysian East Asian Satellite (Measat) would appear to have fallen behind. First announced in 1991, Measat will be owned and operated by Binariang Sdn Bhd. This company is the telecoms arm of Usaha Tegas Sdn Bhd, a corporation controlled by high-flying tycoon, Ananda Krishnan, who is well-known in Australian business circles. Binariang, which started



Experience communication technology of tomorrow...

ATUG '94 is your chance to find out where the constantly evolving world of data, voice and vision communication is heading.

It's a complete showcase of everything that's happening in business and personal communications including the very latest in mobile communications technology.

Major suppliers and industry experts will be on hand to demonstrate and advise you on everything from the latest in small business systems to networking in action on the ATUG Interop. Network.

For a sneak preview of how the future is shaping up, be sure to visit ATUG 94, the 11th Australian Telecommunications and Data Networking Exhibition and Conference.

For conference details call (02) 906 1088

For exhibition details call

(03) 429 6088

...today.

Avoid queues. Fax this form before 22/4/94 to pre-register.
Your admission badge will be mailed to you.
Fax Melbourne (03) 427 0829 Sydney (02) 550 4345.

Name ____________________

Company ____________________

Industry ____________ Title ____________

Address ____________________

____________________ P/code ____________

Phone ( ) ____________ Fax ( ) ____________

Atug'94

THE 11TH AUSTRALIAN TELECOMMUNICATIONS AND DATA NETWORKING EXHIBITION AND CONFERENCE

Royal Exhibition Building, Melbourne
Tuesday, 3rd May 9.00am - 6.00pm
Wednesday, 4th May 9.00am - 7.00pm
Thursday, 5th May 9.00am - 6.00pm

FREE ADMISSION TO BUSINESS PEOPLE

People under the age of 18 years not admitted

RIDDELL
EXHIBITION
PROMOTIONS PTY LTD

On behalf of the Australian Telecommunications Users Group

REP2195

off with satellite distribution of Malaysian horse racing, is following the Satelindo model in Indonesia with licences to operate a GSM cellular system, international gateway satellite services and Measat.

After an early manufacturing MOU with Hughes expired, the Measat system was put out to open tender. A Binariang spokesman said last year the winner would be announced by year-end and it would then take 22 months to build and launch. At press time, no tenderer had been announced.

The Russian Push

A private Russian venture, GloboStar Satellite Systems, is marketing phase array antenna space technology developed by the former Soviet military. The aim is to have at least three spacecraft, known as Coupons, providing 'almost global coverage' by the end of 1995. The Coupon technology enables independently steerable 'scanning spot beams' to focus on any place in the footprint in nanoseconds, with the beams programmed on-board the birds or controlled from the master hub. Tariffs will be based on the power used and hours required.

The venture's Moscow-based parent, Global Information Systems, is a private joint-stock company whose main shareholders include a leading spacecraft manufacturer, a leading payload contractor, SovFinTrade, a Russian-Austrian specialist in systems integration, and the Association of Russian Banks. The Central Bank of Russia, among others, is funding the satellite venture to provide a VSAT network, with 40,000 terminals initially. This 'Bankir' network will be extended to other CIS and worldwide banks, with spare international capacity for lease.

GloboStar's first Coupon, scheduled for launch by a Proton rocket this October, will offer spot beams through Asia and connecting service between Asia, Africa, Europe and Western Australia. GloboStar-2 in May 1995 will cover the Americas, Europe and Asia. The orbital location of GloboStar-3 for the Asia-Pacific is still under discussion. Russia has applied to the ITU for two slots that would expand coverage into Japan and Australia. But Tim Brewer from GloboStar said the company was seeking a mid-Pacific location to cover east Asia, Oceania and the US west coast. It is talking with potential partners, following the collapse of a previous agreement with a Philippine company.

A Canadian-Russian joint venture, SovCanStar Satellite Communications Inc., is planning to launch up to five satellites in Russian slots on the east and west of the CIS. These will provide much-needed domestic services as well as international links to the Asia-Pacific and Eastern Europe. SovCanStar had hoped last year to launch an 'early entry' Gorizont satellite to a slot over PNG. According to Tim Logue, a US space and telecoms analyst, a failed Proton launch prevented this strategy, and a replacement is still under discussion. SovCanStar is 50% owned by Canada's Spar Aerospace Ltd which will provide the payload in association Russian manufacturer NPO-PM providing the spacecraft bus.

The Gorizont (Horizon) satellites, with lives of about five years, form the basis of the former Soviet Union's Statsionar system. An estimated 24 Gorizonts form the main workhorses for communications within the CIS and internationally. Intersputnik, an early Soviet equivalent to Intelsat, leases about 11 transponders on three Gorizonts for international services. For instance, Central China TV (CCTV) uses a Statsionar Gorizont to beam a PAL TV feed to embassies in east Africa and Australia. This feed is also picked up by SBS TV in Sydney. The Gorizonts are scheduled for replacement this year by the Ekspress series with a longer life and more capacity. Russia has about six ITU filings for Ekspress in slots from 53-145°E.

Papua New Guinea and Tonga

PNG and the Kingdom of Tonga have adopted a market-based approach to orbital slots. Despite securing an early lead in the race, the PNG saga goes on and on. It began in 1985 when the then Prime Minister, Michael Somare, informed South Pacific Forum countries that by 1989 they would have three options: Intelsat, Aussat and Pacstar. Based on Japan's RITE study, the original Pacstar concept was to cross-subsidise spot beams for the island nations from 'thick' route traffic between Asia and the US.

Pacific Satellite Inc., the Pacstar company, was initiated by TRT Communications, a US-based international telex and data carrier operating in PNG. Rather than fall under the jurisdiction of the US, TRT principals offered PNG a seat on the PSI board, and free satellite capacity, in exchange for applying to the ITU for orbital slots. During the next nine years, PSI has had a range of owners as TRT sold to United Nuclear which onsold to Pacific Telecom, all US companies. The present ownership includes some original US executives/investors with the PNG Post and Telecoms Corporation (PTC) holding a controlling share.

John Kamblijambi, a PSI director from PTC, refused to comment on future plans, including PanAmSat's upcoming launch of PAS-2 into an adjacent slot which could interfere technically with Pacstar-1, should it ever eventuate. Certainly, PNG's PTC is not waiting for Pacstar's arrival. The construction of a domsat network using Palapa, which began in 1991, is now being transferred to Intelsat. A contract to carry out the transfer, including an Intelsat-A earth station, was awarded to S-A at PTC'94.

The Royal Family of Tonga at this stage would appear to have had more success with its strategy to lease Tongan slots based on their market value. Through Tongasat, a private company controlled by HRH Princess Salote Pilolevu Mafileo Tuita, three slots have been leased to Rimsat Ltd. Rimsat began service last year with two Gorizonts that 'see' Australia. It plans to orbit the first of four Ekspress satellites this year with independently steerable spot zonal beams that can focus on Australia.

The controversial Tongasat venture was conceived by Dr Matt Nilson, an entrepreneurial US engineer. Back in 1987, Nilson gave King Taufa'ahau Topou IV a satellite dish and suggested the Kingdom should file before others for plum Asia-Pacific orbital slots which could 'see' the US west coast and Asian landmass. Under pressure from an outraged Intelsat when the ITU received 31 filings, Tongasat eventually settled for seven slots.

Two new US-based companies, Unicom Satellite Corp. and Rimsat, separately have leased a total of five slots. Unicom has failed to announce finance, but Rimsat negotiated a unique $US130 million deal with Russia's Informcosmos consortium of manufacturers. The agreement included the lease and launch of six Gorizont/Ekspress to Tongan positions, with an in-orbit Gorizont moved to one slot immediately.

Rimsat attracted $US38 million in equity from Tajudin Ramli, Chairman of the Malaysian telco, Technology Resources Industries (TRI), a rival to Binariang. Interviewed last year, Tajudin explained this was a "personal investment." However, he added that TRI was expanding offshore and could use Rimsat's Gorizont capacity in Laos and Cambodia where Russian ground stations were installed already.

Rimsat's end-of-life Gorizont was floated last July to a Tongan slot where PSN of Indonesia had parked its end-of-life Palapa-B1. This was the first major test of the ITU radio rules which are designed to prevent satellites from interfering with each other's signals. Under the rules, it appeared Tongasat had priority status, though the parties agreed to leave the two spacecraft in one slot, with reduced capacity. Further, Tongasat and PSN agreed to explore joint purchase of satellites for other slots.

The commercial arrangements between Rimsat/Unicom, TongaSat, and the Tongan Government are not known. The Princess, who chairs the Tongasat Board and holds a 60% share, has announced recently that she has taken over as Managing Director from Nilson. According to press reports, the increasingly vocal People's Party in Tonga's Parliament want changes to Tongasat's 50:50 profit-sharing deal with the Government which extends until 2003. Meanwhile, Nilson has said discussions were underway with the PTT and C&W (the international franchisee) on the use of satellite capacity.

Liz Fell is a freelance journalist based in Paddington (NSW).

DOS

MACINTOSH

UNLEASH THE FULL POTENTIAL OF NETWARE SAA.

If you have Novell® NetWare for SAA™, you know you have a truly powerful LAN-to-host solution. But you aren't taking full advantage of all that power without equally powerful client software.

Unlike basic 3270 emulators, IRMA™ WorkStation for Windows offers features that bring a whole new meaning to functionality and ease-of-use in micro-to-host communications solutions. It's a powerful application development tool, supporting HLLAPI and APPC and including cross-platform API Tool Kits like our own QuickApp™. Its productivity tools make virtually every task easier and faster.

And since IRMA WorkStation for Windows complies with DCA's Universal Communications Architecture, a framework for consistency across hosts, transports and operating systems, your investment will be protected as your connectivity needs change.

IWW supports many other gateways and connections, including TN3270 over TCP/IP. But if you only need NetWare for SAA support, we have IRMA NetWare WorkStation for Windows. It's optimized for NetWare for SAA, offering IWW's functionality at a lower price.

And now you can get both the NetWare for SAA gateway and IRMA WorkStation for Windows, DOS, OS/2, Mac and Windows NT™ from DCA®.

So you have a single source for sales, training and support. For a limited time, you can trade up from NetWare 3270 LAN WorkStation™ or any other micro-to-host software for only $180. (That's a savings of up to $400. And MultiPaks save you even more.)

The combination of NetWare for SAA and IRMA WorkStation for Windows can bring an easy-to-use graphical interface to multiple mainframe applications.

We'll also send you a free demo disk of any IRMA WorkStation software for any platform.

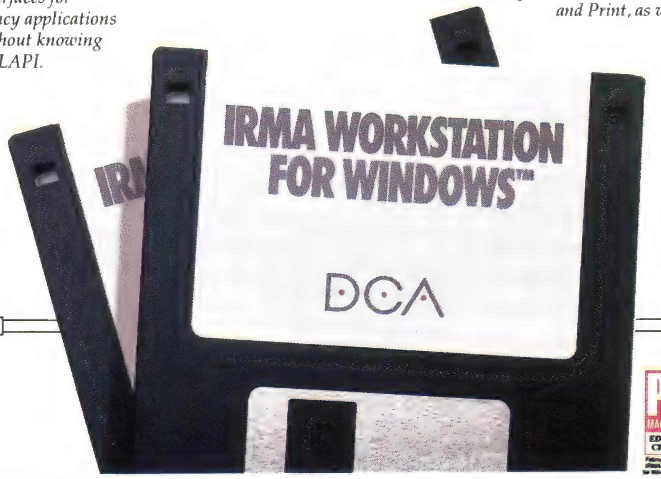
If you want the best LAN-to-host solution, then IRMA WorkStation for Windows is for you.

Call DCA on (02) 451 8255 or fax the coupon below for your $180 trade-up or free demo disks.

QuickApp

Only QuickApp allows developers to create GUI interfaces for legacy applications without knowing HLLAPI.

The only Windows-to-host software with a QuickBar for instant access to functions like File Transfer and Print, as well as other 3270 commands like Reset, Clear and Attention.



FAX TO DCA ON (02) 451 4034 TODAY.

PLEASE TICK ☐ *Yes!* Please send me my free demo disks for IRMA WorkStation.

PLEASE TICK ☐ *Yes!* I would like to upgrade to the IRMA WorkStation for $180.

I have the following computer platform: ☐ Windows ☐ DOS ☐ Macintosh ☐ OS/2

NAME TITLE

COMPANY TEL

ADDRESS

POSTCODE

OS/2

WINDOWS

PC MAGAZINE EDITORS' CHOICE

yes It runs with NetWare

COMPAQ Qualified Solution

DCA

FREEDOM TO COMMUNICATE

DCA Australia Pty Ltd, A.C.N. 056 817 086 20 Rodborough Road, Frenchs Forest, NSW 2086.

Or call (404) 475 8380. Trade-up good in U.S. and Canada only to 12/31/93. Allow 6–8 weeks for delivery. ©1993 Digital Communications Associates, Inc. All rights reserved. DCA is a registered trademark and IRMA and QuickApp are trademarks of Digital Communications Associates, Inc. Windows and Windows NT are trademarks of Microsoft Corporation. The Compaq Qualified Solution Logo is a trademark of the Compaq Computer Corporation. All other trademarks are the property of their owners. Developer-tested only. Novell makes no warranty with respect to this product.

MATRIX D774

Hit the Ground Running

In the race for data/fax modem performance, Rockwell V.Fast Class technology doubles the speed limit, right from the start.

When it comes to modem speed, it seems 14.4 Kbps still isn't fast enough. So Rockwell has done something about it. We're establishing a whole new class of fast: V.Fast Class. That's 28.8 Kbps fast. With Rockwell's V.Fast Class Family, you can have this blazing speed now, so you'll be up and running when the standard is expected to arrive in mid-1994.

V.Fast Class is the world's highest-speed, smallest-package, integrated data/fax modem family – supporting data rates from 19.2 Kbps to 28.8 Kbps. That translates into data transmission speeds 100 percent above the current V.32bis standard. V.Fast Class also provides connectivity to the widest range of modems to date. In addition to the V.Fast Class mode, the family provides compatibility with a wide range of other modem standards, including those governing the installed base of Group 3 fax machines.

Set your sights to finish first. Hit the ground running and install Rockwell's V.Fast Class now. You'll be out front and way ahead, when others are just getting into the race.

V.FAST CLASS ™

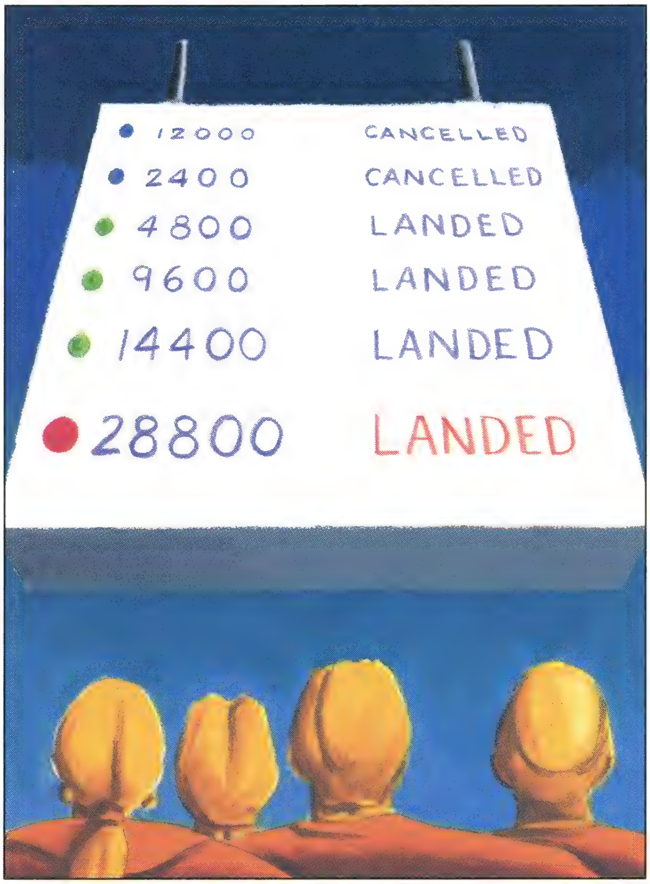
Rockwell International

Hong Kong: (852) 827-0181, Fax: (852) 827-6488 **Korea:** (82-2) 736-9121, Fax: (82-2) 736-9124 **Taiwan:** (886-2) 720-0282, Fax: (886-2) 757-6760 **Australia:** (61-2) 805-5555, Fax: (61-2) 805-5599

Stewart Fist

Your Data: Now Arriving at V.fast Speed

After a lengthy gestation period, the ITU's new V.fast high-speed modem specification is scheduled for a mid-year release. Stewart Fist traces the course of recent modem technology.



The current series of high-speed modems probably began with the V.32 recommendations for 9.6 kilobits per second quite a few years ago. But this 'super-fast' data rate of 9.6Kbps was soon overshadowed by V.32*bis* at 14.4Kbps, and more recently we've seen them jump up to rates of 28.8Kbps and beyond with V.fast (V.34), V.fast Class (a.k.a. V.FC), and V.32terbo.

Of course the marketing claims have jumped even further and faster than the electronics. Australian modem manufacturer, NetComm, says that its new M11F V.fast Class modem has a throughput of 115.2Kbps (a respectable 4:1 compression claim, which is just achievable in some files). But my record at the present is the one from US modem manufacturer, Hayes, which claims 230Kbps, dependent on an 8:1 compression factor! With the new V.34*bis* standard, we can now expect the Hayes record to jump to a claim of at least 256Kbps, unless Hayes marketing executives die laughing first. But despite the overblown PR hype, the technical achievements have still been quite extraordinary.

What is most remarkable about all these modems is that these new high-data rates with compression and error correction seem to have been incorporated right from the start in reasonably priced, production-line units. Usually only the rich can afford the best in the first couple of years after a new modem standard is released, but in the US you can already buy an 14.4Kbps modem for under $US100, and NetComm's M11F is retailing in Australia for $1,499.

Blazing the Trail

The kudos for the first high-speed modem of the modern generation should certainly go to Telebit's proprietary Trailblazer, which was released in 1987 with an impressive peak rate of 18Kbps, at a time when most other modems peaked at 1,200 or 2,400bps. Telebit's breakthrough was in the realisation that CPU crunch-power could make an enormous difference within the modem box — so it made modems into highly-specialised computers with communications functions.

These, of course, were really front-end processors, as are all new modems that have come along since the V.32. Trailblazer incorporated the power of an Apple Macintosh computer in each unit, and racked up its 18Kbps data rate by using 512 parallel low-speed audio frequencies in a multi-channel system controlled by the computer.

Trailblazer depended for its power and intelligence on a Motorola 68000-10 CPU, coupled with a Texas Instruments 32010 DSP, 100K of RAM, 64K of ROM and a Telebit 'World Modem' chip. It wasn't something you put in your pocket when you went off travelling, but it was a highly innovative solution to the data rate problem at the time.

Telebit also devised its own proprietary protocols called PEP and DAMQAM — which was just fine for people who could purchase two of them to swing on each end of a permanent link, which was how they were generally used. The Trailblazer eventually became widely used in the States for Internet feeds and backbones. About 100,000 units were sold, and the latest versions incorporate the V.32*bis*/V.42*bis* standards.

Even though Trailblazer is now old-hat, it's worth taking a quick look at how the high data rates were achieved. PEP stands for 'Packetised Ensemble Protocol' which was a packetising technique used in DAMQAM modems. All of these fast modems send data in packets with a identification header and usually CRC-16 checksum added to the tail.

DAMQAM stands for Dynamically Adaptive Multicarrier Quadrature Amplitude Modulation — if you split the DAM away from the QAM it makes more sense. DAM is a selection technique that depends on intelligent assessment of the quality of 512 separate carrier frequencies, with the computer intelligence testing and selecting only the best; QAM (quadrature, here, means any phase-angle change) refers to the standard series of phase-modulation systems. Depending on the quality assessment and the carrier frequency, the modem assigns 2-bit DPSK, 4-bit QAM or 6-bit QAM to each usable carrier frequency.

Most of the channels operate at a relatively low rate, which is essential. These are all half-duplex channels, without any echo cancellation since there's no practical way to cancel echo on, say, 400 different functioning channels simultaneously. So without echo control, the data rate on each channel is strictly limited.

Since these modems are sending data in parallel over about 400 audio frequencies, the data must first be segmented into packets with a header containing a sequence number — which is the Packetised Ensemble Protocol function. PEP limits packet-size to whatever can travel over the various data rate channels in a certain time, so data packet 'times' are standardised, but packet 'size' can actually vary according to the modulation techniques being employed on the channel.

Single Channel vs Multi-Carrier

Despite the innovative approach of Telebit, and the obvious revolution in throughput the Trailblazer represented, when the V.32 modem standards were being devised by the CCITT (later the ITU-T) it was decided not to take the multi-carrier approach but to stay with the tried and tested single channel (each way) solution and concentrate on solving the echo problem. Initially, it wasn't really clear how this could possibly produce better results than a multi-carrier system, but it's fair to say the ITU-T committee turned out to be right.

Echo was the first problem to be overcome. If you are sending and listening at the same time over a single channel at very high data rates, then you'll constantly find yourself awash with your own return-sound which is being reflected back by the carrier's hybrids, translation points between optical fibre and conventional copper networks, and from the distant modem itself. You get a measurable echo whenever there is an impedance change, a splice, a transformer, slow electronics, etc. on the line. The V.32 committee's decision wasn't just conservatism; it realised that this new intelligence in modems could be applied effectively to echo control and error correction, and that it was then most effective to power the data over the best-possible single audio-channel at the highest rate achievable.

Figure 1A: 16-Point Signal Structure

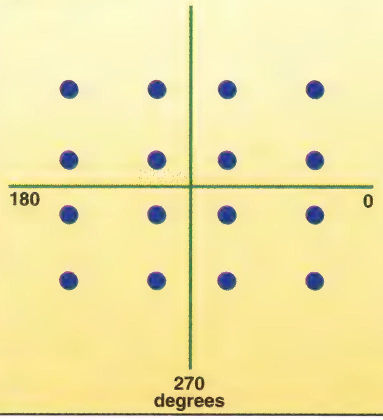
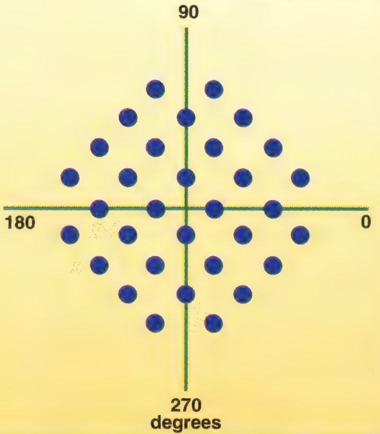

16-point signal structure with QAM. Amplitude changes are measured from the base-lines, phase is `differential' in the quadrants

Figure 1B: 32-Point TCM


The 32-point Trellis Code Modulation system, with quinbits

The famous Shannon's Law, which sets a finite limit on the rate of data possible over noisy lines, offered no guidance as to which approach is the better. Theoretically this single-channel solution is just as valid as the multi-channel Telebit idea. And, in practice, it turned out to be better.

The V.32 Series

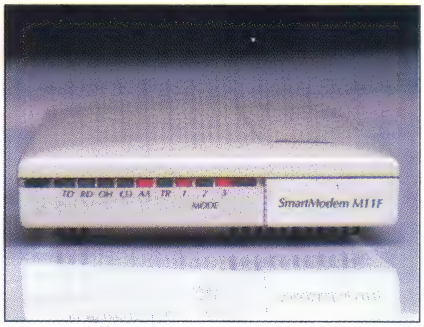
We've now had the V.32 standard for a few years, and it has provided us with good 9.6Kbps full-duplex dial-up modems which have worked surprisingly well. V.32 is built on a foundation of a phase-change QAM modulation scheme, coupled with two levels of amplitude. Both modems in a full-duplex link-up use the same 1,800Hz audio carrier which is modulated by changing the phase of the audio cycle through 45 degree increments.

This provides us with a 'constellation' having 8 points for phase, in each of two levels of amplitude — 16 points overall (Figure 1A). Note that the phase is not measured from a fixed reference, but is 'differential' — it is referred to the audio frequency remaining after the last change — hence the term Differential Phase Shift Keying (DPSK). QAM (Quadrature Amplitude Modulation) is any variation on DPSK which includes amplitude changes also.

V.32 modems operate at 2,400 baud; but overall, four bits (quadbits) of information are transmitted at each phase/amplitude 'event' or 'symbol' — giving it the 9.6Kbps data rate. The 1,800Hz frequency was chosen as the carrier because it is the theoretical centre frequency of the telephone network. If we assume that the phone system will adequately transfer audio tones from 300 to 3,300Hz, then 1,800Hz is about mid-way.

You might wonder why this relatively low audio frequency is necessary with a QAM system — why not operate the carrier at the top frequency, say around 3,200Hz, where phase-changes can obviously act much quicker? It is important to realise that abrupt changes in the phase of the carrier are, in effect, equivalent to instantaneous frequency changes and in practice no system can make these instantaneous changes, nor can any networks carry them. The highest bit-rates possible are dependent on the centre-frequency used; and the allowance that must be made for the two side-bands (to the highest and lowest Hz) which can be carried over the network.

You can see, therefore, that the choice of the best centre-frequency is crucial — and in a fixed standard like V.32 it must be


One of the new breed of V.fast Class modems, NetComm's SmartModem M11F

a compromise depending on the bandwidth and the line conditions.

This is over-simplified, but it serves to explain two things about phase-change modem limits:

- Why you can combine frequency and amplitude changes, or phase and amplitude changes in a modem standard — but never use both frequency and phase changes together to any advantage; and
- Why some phase-change angles (such as 180 degrees) are much harder for the system to handle than others — they can produce very much higher transitional frequencies.

And this leads us to the value of Trellis Coding.

Trellis Coding

The early V.32 modems were straight QAM systems, but shortly after the first were released they also began to include a Trellis Code Modulation (TCM) variant which was negotiated during the handshaking phase, which makes an enormous difference to the modem's noise tolerance.

Trellis Coding is used as a form of parity checking, but its real value is in interpreting data transmitted over networks subject to echo problems. If TCM is in use, the V.32 modem being used still has the same 2,400 baud/9,600bps data rate, but it also provides a degree of error-checking and correction through an extra bit (quinbit) in each symbol (Figure 1B).

Trellis Coding is a complex modulation/error scheme which introduces additional points into the constellation while also prohibiting the use of some points. It has rules which establish how close to, or how far from, the present phase-angle the next change can/must be, and it also holds in memory a record of the last half-dozen changes, to which complex predictive algorithms are applied. So it knows, to a degree, what to expect at each change.

A TCM modem can therefore identify inconsistencies in the symbol received by checking the real against the prediction — so it has some forward-error correction (FEC) functions as well. All of the V.32 series (other than the first) now use Trellis Code Modulation as a matter of course.

V.32*bis*

The V.32*bis* (second or 'encore') standard came along a few years later (in February 1991), and at the time of writing this is the current most popular full-duplex, dial-up, modem standard. It builds on the success of TCM and V.32 by boosting the peak data rate to 14.4Kbps over telephone lines which were previously thought only just adequate for the 9.6Kbps data rate of original QAM-based V.32.

The *bis* superset improves on the older V.32 also by providing faster initial handshaking, automated line testing, as well as a chain of fall-back rates of 12,000, 9,600 and 7,200bps (depending on the line conditions). The factors negotiated during the handshaking procedures can also be renegotiated during transmission, and so the modem has the ability to fall-back or step-up its data rate at any time. It does this either by monitoring the data-packets constantly for errors, or by monitoring the phase-jitter (the phase-variations from normal) at each symbol — either approach can be implemented by the modem manufacturer.

Error Handling

Since these error detection functions were becoming necessary to handle the fall-back process, it became obvious to those in the modem-standards business that full error-detection and correction should be implemented in the modem, rather than in the software of the PC. Microcom was the first to put this into practice and it created the MNP 1-4 protocol series with progressive improvements in modem error-handling. It took the ITU-T many years to catch up.

The MNP 'protocol suite' is an expandable and layered system which conforms to the OSI's model. The various layers provide reliable flow-controlled and transparent data transfer — both as a stream of bytes and as files. Byte stuffing is used on byte-oriented machines, while SDLC framing is used for bit-synchronous hardware and sync modems.

At the Physical Layer you'll find RS-232, while the Data Link layer of MNP provides data flow and error control. For its error checking, MNP relies on the standard 16-bit CRC with positive acknowledgment and retransmission when necessary.

There are currently 10 in the series, but only the first five and the last (MNP-10) are widely used. MNP-1 is an old asynchronous half-duplex protocol that is rarely used today; MNP-2 is for full-duplex, and has a byte-oriented checking system (this is now the fall-back protocol for all MNP products); MNP-3 is a popular PC modem standard for synchronous communications (it is bit-oriented, and has excellent error-checking); and MNP-4 is the current de facto standard for modem error correction. Later upgrades in the error-checking series haven't really caught on — the V.42 stand-

Meet You at the UART

The UARTs (Universal Asynchronous Receiver/Transmitters) behind the serial port of most computers were designed in the days when maximum data flows were in the order of 9.6Kbps. Now, with 32-Kbps transmission rates and 3:1 compression and decompression taking place in the modem, the RS-232 serial port and the UART need to handle data throughput at nearly 90Kbps.

The older 16450-type UARTs on most PCs (since the AT, and still current) can't handle data at anything near this rate with constant interrupts from TSRs and software, and therefore the serial port becomes the bottleneck. Even the newer 16550 UARTs with 16-byte FIFO buffering can only raise the rate of throughput by a factor of two or three — which is still below the theoretical average rate we should be able to achieve with text over V.34/V.42*bis* modems.

Software will need to be upgraded to support these higher rates also, don't forget. With Windows, the maximum you can pump through some COM ports is still only about 12Kbps because of the interrupt-handling whenever the computer is offloading data to disk — and don't forget interrupts can be even worse with multitasking operating systems.

There are a number of possible solutions to this problem, including: EIA-530A, an interface formulated several years ago to replace both RS-232 and V.35 which supports data rates up to 2.1Mbps; V.10, an electrical standard that can use the same hardware as RS-232 and support data rates up to 100Kbps but has different electrical characteristics (but the problem is that while V.10 could be implemented in new serial interfaces, the UARTs and software would remain unchanged); the IEEE 1284 standard for bidirectional parallel ports already installed on most PCs; and connecting via a PCMCIA interface now available on most new laptops (although this solution will have to wait until it is possible to implement V.34 on the PCMCIA form factor.

Some of these ideas are better than others and are being implemented now. Microcom, for instance, is putting a special parallel port on its modems, and by providing a software driver which makes the parallel port look like a serial port to your usual personal computer communications software. PC parallel ports run a great deal faster than conventional serial ports — and they don't need a UART.

An alternative approach is to use proprietary enhanced serial interfaces from Hayes and others. Hayes' new ESP (Enhanced Serial Port) adaptor upgrades the UART and isolates it from DOS interrupts. This card has two serial ports complete with an onboard coprocessor and its own large buffer (dual 1,024 bytes FIFO), and it substantially reduces the CPU's workload.

Stewart Fist

ard from the ITU-T has proved to be much better.

However, MNP-4 is still a very good error-control protocol: it has the ability to adapt to line conditions, and it sends data in variable-length packets according to line quality. Control information is constantly exchanged between MNP modems to keep the link running at the best possible rate. This process of packet-size reduction as a trade-off for line quality has been translated into the new MNP-10 protocol, which is also proving to be highly successful.

The ITU-T's V.42 protocol was built on the MNP-4 model, but it defines error detection methods using LAP-M as the basic function (which is, itself, based on the Link Access Procedure/D-channel used in ISDN). To be fully compliant with V.42, a modem must implement LAP-M and also some alternative protocols based on MNP Classes 2-4. The key word to watch here if you are buying a modem is 'fully' compliant — modems can be 'compliant' without implementing everything required.

The fact that the ITU-T required compliance with proprietary MNP standards, came about because Microcom sued them for stealing patents when V.42 was being formulated. A deal was struck to always include MNP 2-4 as a fall-back. During the handshake negotiations, two V.42 modems will attempt to apply LAP-M, and if this fails they will then use MNP-4.

V.42 error-correction really only became popular when it was coupled with either MNP-5 or V.42*bis* data compression, and also with the modulation standard V.32*bis* with its 14.4Kbps data rate. But remember, there's no real connection between the modulation standard, the error-correction standard or the data-compression standards — except that the error information can be used to trigger the fall-back.

It has, of course, been possible to transfer the V.42 (error) and V.42*bis* (compression) standards to later and faster modem standards, and in fact, there's no reason why they couldn't also be used on a ISDN network (except that ISDN already has LAP-D built-in). So, don't be fooled by ads which say that V.fast Class modems are now faster than ISDN — they are comparing the transmission of a highly redundant image file with, say, 4:1 compression, to ISDN transmitting text without compression — they are comparing apples to oranges — or rather, dried apple concentrate to fresh orange juice.

V.32*ter* (third) was to have been another superset pushing the basic standard up to 19.2Kbps (with fall-back rates of 16.8 and 14.4Kbps), but the standard was never approved by the ITU. Instead, it decided to switch tack and develop V.fast (V.34), which introduced some new carrier concepts. However, AT&T Paradyne and National Semiconductor became frustrated with the quite slow progress on V.34 definition, and decided to introduce V.32terbo as a 'rogue' standard.

V.32terbo is therefore a proprietary standard which incorporates a play on words in its name — or a 'con,' to put it less politely. The name suggests that this is a normal member of the ITU's V-series, but it isn't — and there's no guarantee that it is 'turbo-charged' either.

The vendors claim that V.32terbo gives data rates of 16.8 and 19.2Kbps using the two-dimensional 8-state Trellis Coding (same as V.32*bis*), and the same single-channel baud rate of 2,400Hz. The chips being used for V.32terbo modems will generally provide a combination of V.32*bis*, V.32, V.42*bis* data compression, and both V.42 (LAP-M) and MNP 4 error control. But note, there's no suggestion that they'll be compatible or convertible to V.34 (V.fast). Independent line tests seem to agree that V.32terbo can't tolerate even normal line noise without excessive error rates at its supposed top rates. There's a rule which says that with any modulation scheme, each 2.4K boost in the data rate adds a further 3dB to noise-intolerance. So with the V.32 scheme, a step up from V.32*bis* (at 14.4Kbps) to V.terbo (at 19.2Kbps) means you'd get the same error rate only if the transmission lines were 6dB better.

These signal-to-noise ratios can generally only be achieved today over private cables, or specially conditioned lines. To put it bluntly, the V.32*bis* standard was already pushing the limits of this modulation technique over public phone lines, so V.32-terbo is unlikely to be any better on a comparable circuit — it will probably always fall back to V.32*bis* rates anyway.

What characterises the V.32 modulation series is the use of a single fixed audio frequency (1,800Hz) for both the originate and the answer modem. This sounds crazy when you first think about it — the modem is transmitting information by phase- and amplitude-changing a single audio frequency, and it is also listening on the same link at the same frequency for the remote modem doing the same thing at the other end. It sounds like a recipe for total confusion — and it is, except that we now have computerised digital adaptive filtering.

The trick is to use digital filters (mathematical subtractions taking place in RAM) to totally remove any echo of your own transmissions, leaving you listening only to those created by the remote station. You can do this with a fairly active CPU, provided you can first test the line for echoes before transmission begins. You use this 'training' period to automatically generate an echo profile (what to expect) whenever any data is transmitted.

Your modem's in-house computer then knows what (and when) to expect in the way of echoed 'noise' on the link. It will take a copy of everything transmitted, delay it and weight it according to the echo profile, and then subtract these results from the incoming signal. This 'adaptive-digital' approach to echo reduction works extremely well, and provides the key to these faster data rates. Echoes are 'noise' and Shannon's Law tells us that the less noise there is on the line, the faster we can transmit.

V.fast or V.last?

V.34 is the new ITU standard which was previously called V.fast. The standard has not yet been finalised (June 1994, if we are lucky) but it is for 28.8Kbps full duplex, dial-up modems which are highly adaptive and able to take into account poor-quality connections.

Where V.34 differs from V.32 is in the selection of the single carrier frequency — and this has given rise to the mistaken belief that V.32 is therefore a return to the old Trailblazer 'multi-carrier' system. But it's not. What V.34 does is to probe the telephone line conditions to determine the optimal frequency range of the link before transmitting. Once it knows the boundaries of reliable bandwidth, it can calculate the optimal centre frequency, and then transmit happily (both ways, as in V.32) on this. So what they mean here by 'multi-carrier' is a single carrier which can be set to a variety of frequencies.

In many parts of Australia these days the optical fibre network and digital switches will carry audio up to about 3,800Hz; so often the new V.34 modem could afford to use a higher carrier frequency than the old 1,800Hz standard fixed for all the V.32 standards. The higher the carrier, the faster the data rate (but remember they've also got to allow for the higher side-band frequencies generated by the phase changes!).

The new modems will also monitor the channel and make changes during transmission — they can 're-train' if necessary. V.34 uses a multi-dimensional form of TCM, with between 16 and 24 states, and it has a variable symbol rate of 3,200 or 3,429 baud (related to the frequency being used).

Despite this complexity, the ITU says that the handshaking period has been cut from the seven seconds needed by V.32*bis* modems to about five seconds. This is certainly an impressive gain when you consider that the intention is that these modems will be able to work with the entire range of duplex dial-up modems, function with existing Group 3 fax modems, serve as the basis for new high data rate facsimile transmissions, disable network equipment that compresses the 64Kbps PCM (pulse-code modulation) channels, and ultimately support videophone and other new services.

All this is theoretical at present, because the V.34 standard will not be finalised until June 1994, and in the meantime Rockwell has come out with a highly successful semi-

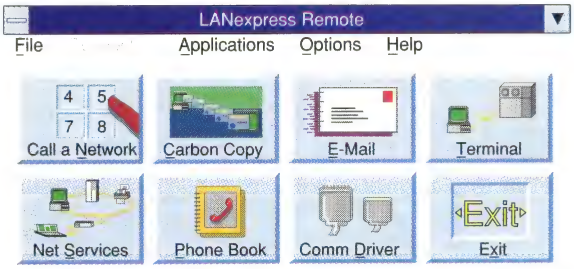
microcom Introduces
LAN Express & V.fast Modems

microcom
Features
• 28.8 Kbps Modem With Fax
• 115.2 Kbps Data Throughput Using V.42bis & MNP 5 Data Compression
• Parallel Port Interface For True V.fast Data Throughput Rates
• Compliant With CCITT V.32bis, V.32, V.22bis, V.22, V.21, Bell 212A, Bell 103
• MNP® 10 For Reliable Connections
• 9.6 Kbps, Group 3 Fax
Microcom
DeskPorte FAST™
Get Connected And Stay Connected At V.fast Speeds
DeskPorte FAST™
28.8
TravelPorte FAST™

If you're V.fast, you can get twice the speed for around the same price.

Without a doubt, the easiest, fastest remote access solutions in the world, using LAN Express, our *V.fast* modems and MNP 10.

The new top of the line Microcom modems give you all the advantages of *V.fast* performance. For around the same price as V.32bis.



Microcom, the people who put the fast in *V.fast,* let you transfer files in half the time. Enjoy reliable connections with Microcom Networking Protocol -(MNP 10). Let people get on and off your LAN faster to optimise your network capacity.

And for remote users running Windows, the best news is that Microcom builds in a parallel port interface (in addition to the usual serial port) for true high speed throughput (115.2Kbps).

Now, any application that demands top speed and reliability, such as remote LAN access, remote Windows, large file transfers, imaging and graphics, can all be throughput at better than twice the speed. DeskPorte-*FAST* and TravelPorte-*FAST* both support 14.4Kbps fax and come with a five-year warranty. Microcom's performance is proven with over 15,000 installations.

So now you can get *V.fast* speed for a *V.Low* price. Call Microcom today on (02) 410 9953 at Level 6, 10 Help Street, Chatswood NSW 2067.

microcom®

Ric-Creations MIC 009 PC WD

standard called V.fast Class which almost every modem maker, including Australian manufacturers NetComm and Banksia Technology, seem to think is the way to go — if only temporarily. V.fast Class also offers 28.8Kbps and the modems will be on sale by the time you read this. V.FC or V.34 FC, as it is sometimes known, is actually the old V.34 standard before the ITU decided to go back to the drawing board and add a few more line-adaptive and processing features. It is therefore likely to be very close to the final V.34 standard. Rockwell has guaranteed that the modem chips will be plug-compatible, so you'll be easily able to upgrade if you think that's necessary. Chris Howells of NetComm says he doubts that it will be.

V.34*bis*

In fit of light-headedness, the ITU also decided at one time to introduce V.34*bis*, which was to take the data rate up to 32Kbps. But while they seem to have maintained their ambition, they've since abandoned the '*bis*' suffix, and included this higher data rate as an option in the 'normal' V.34 standard. I guess this suggests that they think the higher rate can be achieved without any change in modulation techniques, so perhaps even this will also be possible after June.

But it all begins to get rather academic. Are we in the realm of the fairies here? Is this all fanciful speculation, or real possibility? Will our telephone lines carry these data rates?

The problem is with line quality. Shannon's limit depends on the bandwidth of the circuits, but it is also related to the noise on the line — a factor in the calculation that many people seem to neglect. If you assume a 30dB S/N ratio and 3,100Hz of bandwidth, then the data rate limit should be about 31Kbps. If you are lucky enough to have a quieter channel, of say, 40dB S/N, the equation returns about 41Kbps. But remember that Shannon's is a theoretical limit, assuming that everything else in the system is perfect — which it never is.

What seems to puzzle most people about this limit is the knowledge that ISDN circuits carry 168Kbps over normal phone lines, and that Telecom is introducing ADSL and HDSL techniques for video which can bring data down the standard twisted pair at 2Mbps. These speeds would seem to suggest that Shannon's Limit has been breached.

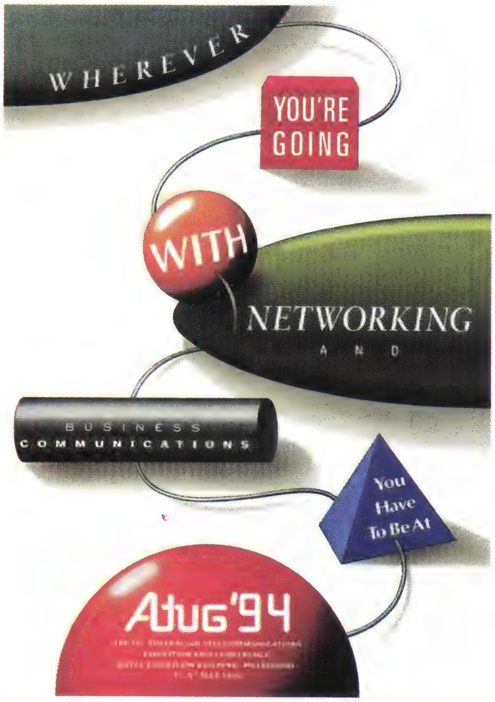
What is being forgotten here is that ISDN and ADSL/HDSL are 'access technologies;' they exist in that form only as far as the nearest exchange. And between you and the local exchange, the bandwidth on twisted-pair can be in the megahertz range quite easily, rather than kilohertz. In fact, ADSL is transmits along these wires bandwidths reaching above 1MHz, which makes it really a guided-wave radio transmission system, where the twisted pair is just a long antenna.

The limitations over the local-loop are just on the noise in these cables, and this is obviously going to be highly variable; the noise figure will be low with only one ADSL/HDSL user in a street duct, and much higher with many. This, I suspect, is why Telecom is increasingly coupling the terms 'ADSL' with 'over coaxial' where previously it was boasting about its viability over copper twisted pair.

However, there's no doubt that ISDN and ADSL/HDSL techniques offer a clear 'service' alternative to modems at rates above V.34. It makes considerably more sense to take advantages of ISDN's packet-switching D-channel and twin B-channels if you really need rates in the region of 32Kbps and above. But the limit is not being imposed by Shannon so much as by commercial sense.

Stewart Fist is a freelance journalist based in Lindfield, NSW.

12,000 COMMUNICATIONS BUYERS HELD CAPTIVE!



Over 12,000 people are expected to visit the annual communications expo

ATUG'94

(3rd-5th May 1994 - Royal Exhibition Building, Melbourne.)

These people represent the key communications professionals responsible for purchasing much of Australia's communications equipment and services.

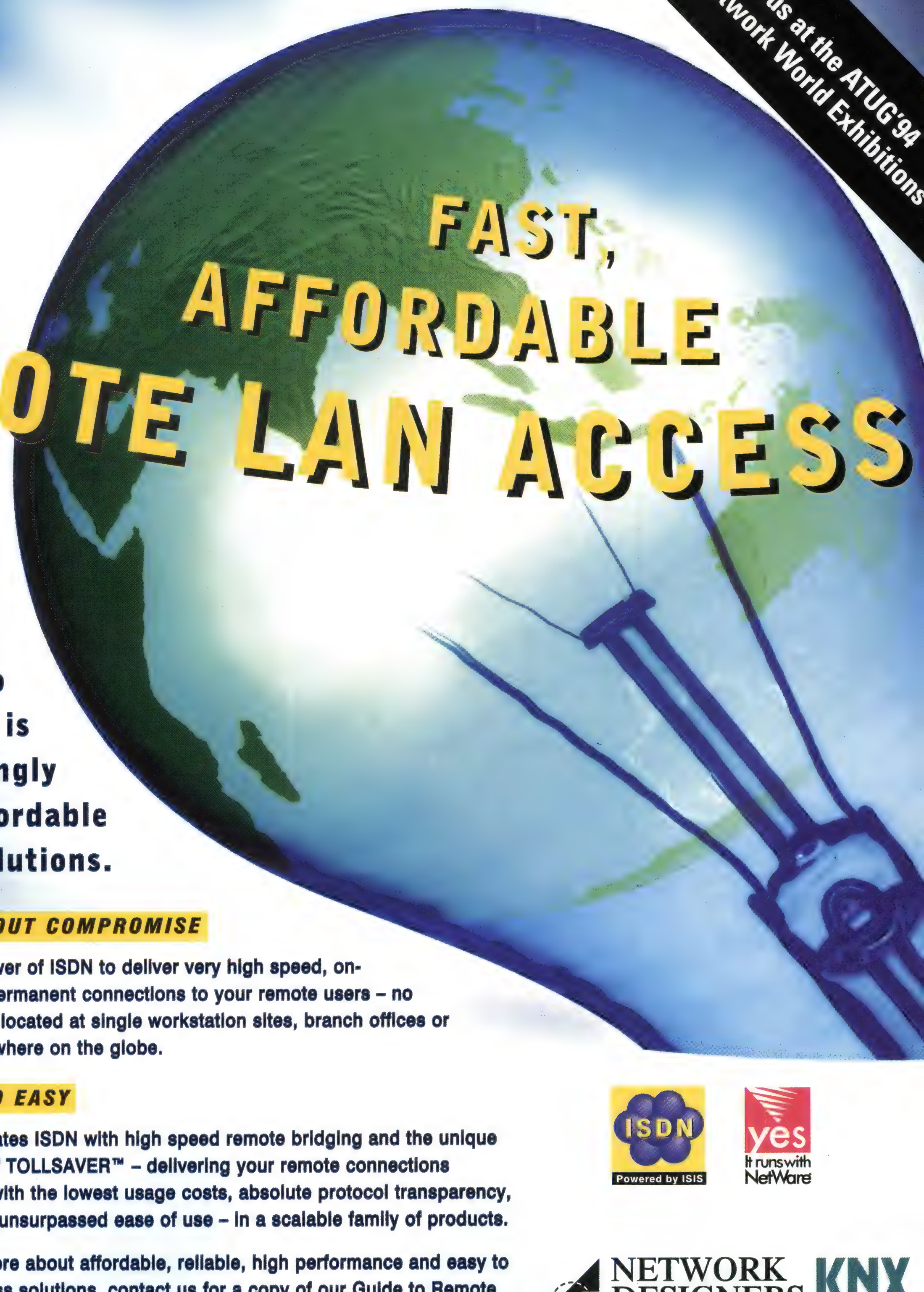
Handed to each visitor on entry to the exhibition is the official ATUG'94 Visitor Guide. Filled with exhibitor details, floor plans, conference schedules, a product index and supporting editorial, the Visitor Guide will be the major reference source during and after ATUG'94.

Advertising bookings for this publication can be made by contacting Dawn Switzer on (02) 264 2200.

Published by Ostasun Pty Ltd, Level 4, 541 Kent Street, Sydney NSW 2000.
Publishers of *Australian Communications* Magazine

ISIS

See us at the ATUG'94 & Network World Exhibitions



FAST, AFFORDABLE REMOTE LAN ACCESS

Extending your LANs to remote sites is now surprisingly easy and affordable with ISIS solutions.

🌐 ACCESS WITHOUT COMPROMISE

ISIS harnesses the power of ISDN to deliver very high speed, on-demand, dial-up and permanent connections to your remote users – no matter whether they're located at single workstation sites, branch offices or regional centers – anywhere on the globe.

LOW COST AND EASY

ISIS seamlessly integrates ISDN with high speed remote bridging and the unique protocol intelligence of TOLLSAVER™ – delivering your remote connections maximum throughput with the lowest usage costs, absolute protocol transparency, complete security and unsurpassed ease of use – in a scalable family of products.

If you want to know more about affordable, reliable, high performance and easy to use Remote LAN Access solutions, contact us for a copy of our Guide to Remote LAN Access and ISIS or talk to one of our product specialists.

Call our Asia Pacific headquarters in Melbourne on Tel. +61 (03) 629 3800
Or simply copy your business card onto this page and
fax it to us on Fax. +61 (03) 629 5791

ISDN Powered by ISIS

yes It runs with NetWare

NETWORK DESIGNERS KNX
LEADERS IN REMOTE LAN ACCESS

Network Designers KNX Pty Ltd
Level 9, 22 William Street
Melbourne VIC 3000 Australia

ISIS products are available from authorised resellers and systems integrators in Australia, New Zealand, Asia, Europe, USA and the United Kingdom. European region: KNX Ltd. Otley, United Kingdom Tel. +44 (0943) 467 007 North American region: KNX Inc. California, USA Tel. +1 (510) 942 3115

ISIS SUPPORTS all workstation-to-workstation, workstation-to-LAN and LAN-to-LAN connections within DOS, Windows, Windows for Workgroups, OS/2, Novell, UNIX and 802.3/5 environments. **ISIS FEATURES** include ISDN, DDS and modem interfaces supporting MAC level protocol transparent source learning bridging, auto call establishment on TCP/IP IPX and NetBIOS protocol types, protocol spoofing TOLLSAVER™, auto disconnect, channel aggregation, bandwidth-on-demand, call tenacity, data compression, voice integration, call acceptance security, data encryption, bi-directional source and destination filtering, X.25 service over both ISDN B and D channels, workstation NDIS and ODI drivers, file server resident modes, Application Program Interfaces, international permits. AUSTEL A93/85B/0053, New Zealand PTC 231/94/001, ETSI NET 3. All rights reserved © 1994 Network Designers KNX Pty. Ltd. All trademarks are the property of their respective owners.

CONCEPT, DESIGN & ARTWORK BY OPSIS DESIGN AUST +61 (3) 510 3222

Too fast for the competition (again)

NetComm. First to introduce V.FAST Class in Australia.

'Speed' is an over used word these days, particularly when it comes to modems. Some manufacturers claim speeds of up to 115,200bps. The fact is, if they have an 8 bit processor, they simply run out of grunt at about 35,000bps.

The 16 bit processors in NetComm's new V.FAST Class SmartModem range, however, have real speed and real power. They support transmission speeds of up to 28,800bps and throughputs of up to 115,200bps are a real possibility. There is nothing faster.

Plus, the SmartModem M11F has the horsepower to deliver high-end features like DES encryption and MNP10 which achieves maximum data throughput on noisy or poor line conditions.

The new V.FAST Class range from NetComm gives 'speed' a new meaning. And because time is money, you won't need long to think it over. Call us now.

Designed, manufactured and supported in Australia, the SmartModem M11F has a suggested retail price of $1,499

16 BIT

NetComm®
SmartModem

KEEPING YOU EVEN FURTHER AHEAD.

Sydney Phone: 888 5533 Fax: 805 0254 Melbourne Phone: 696 2222 Fax: 696 6017 Brisbane Phone: 852 1666 Fax: 252 2255
Perth Phone: 470 5111 Fax: 470 5122 Adelaide Phone: 376 1475 Fax: 376 1475

Words At Work Net 054

Kevin Tolly
and David Newman

High-End Routers: An In-Depth Evaluation

The names Cisco and Wellfleet are synonymous with routing, and as this latest round of performance testing indicates, both companies are working hard to maintain their market-leading positions.

Coke and Pepsi, Ford and Holden, Cisco and Wellfleet. Every market has its leaders — whether we're talking high-calorie soft drinks or high-end hardware. And while the two multiprotocol router vendors are hardly household names, the latest Data Comm Lab Test shows why this pair — mortal enemies to hear them tell it — are the dynamic duo of corporate internetworking.

At this point, multiprotocol bridge/routers are the basic building blocks of enterprise networks. That's why the Test Lab decided to evaluate these boxes from every angle. As always, performance topped the list: we checked out raw speed, how different mixes of traffic affect overall throughput, and latency on Ethernet and Token Ring. We also took a close look at other critical criteria, including fault tolerance, ease of installation, configuration, and management.

Of the six routers we tested, the AGS+ from Cisco Systems and the Backbone Concentrator Node (BCN) from Wellfleet Communications ran the fastest, pure and simple. No matter how much traffic we threw at them and how many different mixtures we used (a total of 48 in all), both vendors' products handled the load without a hitch. For those reasons, each has earned a Tester's Choice award.

Our two winners weren't alone in this: overall, we came away very impressed with the performance of most of the routers we checked out. The only real shortcoming, in fact, proved to be small-packet throughput over Token Ring — something we've seen before in other evaluations. (The Lab, as always, tested each product to see how well it handles small, medium, and large packets.) And there's other good news: high-end routers are getting more reliable. Several products showed up with fault-tolerant features like redundant power supplies and hot-swappable interface cards. On the downside though, configuration remains dauntingly complex — at times even proving too much for the vendors' own engineers.

Five vendors agreed to participate in this round of tests: Alantec, Network Systems Corporation, Retix, 3Com and Wellfleet Communications. Cisco Systems declined our invitation (along with several other vendors), but in view of the company's commanding market share we felt we had to include a Cisco router in this test. A financial institution loaned us a Cisco AGS+, the router used in more central sites than any other. (Last May, Cisco introduced a higher-capacity router, the Model 7000, but there are still far more AGS+ routers in the field.)

All of these products are built expressly for central-site routing (see the table on page 90). They bristle with ports, connecting as many as 56 Ethernet or Token Ring LANs in a single chassis. Most of these boxes — with the exception of Alantec's and 3Com's — are scalable: each interface card is loaded with its own processor. And all of these high-end units boast high-speed backplanes to make sure there is no time lost getting data where it needs to go.

Beyond Brute Force

Raw performance is important, and high-end router makers are fond of citing aggregate processing rates that approach 500,000 packets per second. But these sorts of numbers are achieved on test beds

Selected Vendors of High-End Routers

VENDOR	PRODUCT	SOFTWARE RELEASE	TOKEN RING CHIP SET/DRIVER	MAXIMUM ETHERNET/ TOKEN RING SEGMENTS	ROUTING PROTOCOLS	BRIDGING PROTOCOLS
Atlantec Comperex (02) 878 5888	Powerhub Model 3500	2.3-M2	N/A	12/none	IP, IPX, DECnet Phase IV	Transparent
Cisco Systems (02) 957 4944	AGS+	9.1.2	TI TMS380/Madge Turbomac	28/28	IP, IPX, DECnet Phase IV, OSI, Vines, XNS, AppleTalk	Source Route Transparent
Network Systems Corp. Techway (02) 975 2122	6800 Series	5.1 (Ethernet) 6.0 (Token Ring)	TI TMS380/Madge Turbomac	56/56	IP, IPX, DECnet Phase IV, OSI, XNS, AppleTalk	Source Route Transparent
Retix (03) 563 4333	Routerxchange 7500	2.10	TI TMS380/TI Mac	12/12	IP, IPX, DECnet Phase IV, OSI	Source Route Transparent
3Com (02) 959 3020	NetBuilder II	6.2	TI TMS380/TI Mac	16/8	IP, IPX, DECnet Phase IV, OSI, Vines, XNS, AppleTalk	Source Route Transparent
Wellfleet Communications (02) 955 2955	Backbone Concentrator Node	7.56	TI TMS380/Madge Turbomac	52/52	IP, IPX, DECnet Phase IV, OSI, Vines, XNS, AppleTalk	Source Route Transparent

TI = Texas Instruments

tuned for maximum throughput — one protocol, one packet size, one-way traffic. To evaluate routers under real-world conditions, a testing metric has to encompass more than just packets per second.

That's why the Lab took a close look at the degree to which throughput is affected by various protocol mixtures (in essence, determining if throughput degrades when the router simultaneously services different stacks). Our goal was to see whether routers handle multiprotocol streams as efficiently as single-protocol ones. In this area, most of the boxes performed beautifully: many of our test results show little, if any, performance degradation as a result of mixed streams (particularly at larger frame sizes and on Ethernet LANs).

And in some cases, degraded throughput as a result of mixing protocols may still be acceptable; for instance, when the affected protocol isn't the main one on the network. A router that shows performance degradation when IP traffic is added to the mix might still be appropriate for sites where most traffic comes from NetWare LANs (where IPX is the rule) and SNA hosts (where unroutable 3270 traffic is usually bridged). In our tests, this is exactly what happened with Retix's Routerxchange 7500 over Ethernet LANs. Conversely, NSC's 6800 Series router favored IP traffic: the more IP included in the mix, the faster the NSC router ran.

Depending on your perspective, latency — the delay incurred as a packet passes through a device — is either crippling corporate internetworks or adding a negligible amount of overhead. The Lab tried to evaluate the effects of latency on end-session response time, but found that so many other factors also came into play that it was impossible to make a determination.

In an attempt to see how latency slowed throughput, we repeatedly copied a one megabyte text file on a single LAN, using IPX across a router, and using source route bridging across a router. Over the course of 30 file transfers, we saw our results within each group vary by as much as 31% — an unacceptable margin of error. Further, the results within each group differed by as much as 0.5 second, which cannot be blamed on latency.

Among the other possible contributing factors are the speed of the end-station's CPU, hard disk, and network adaptor card; LAN cable lengths; and efficiency of the application. Most likely, the large variations we observed can be attributed to attempts to write to a different part of the PC's disk for each file transfer.

A Matter of Trust

After performance, most network managers consider reliability to be critical when evaluating routers. But this is hardly surprising, given that router downtime can play havoc with corporate connectivity.

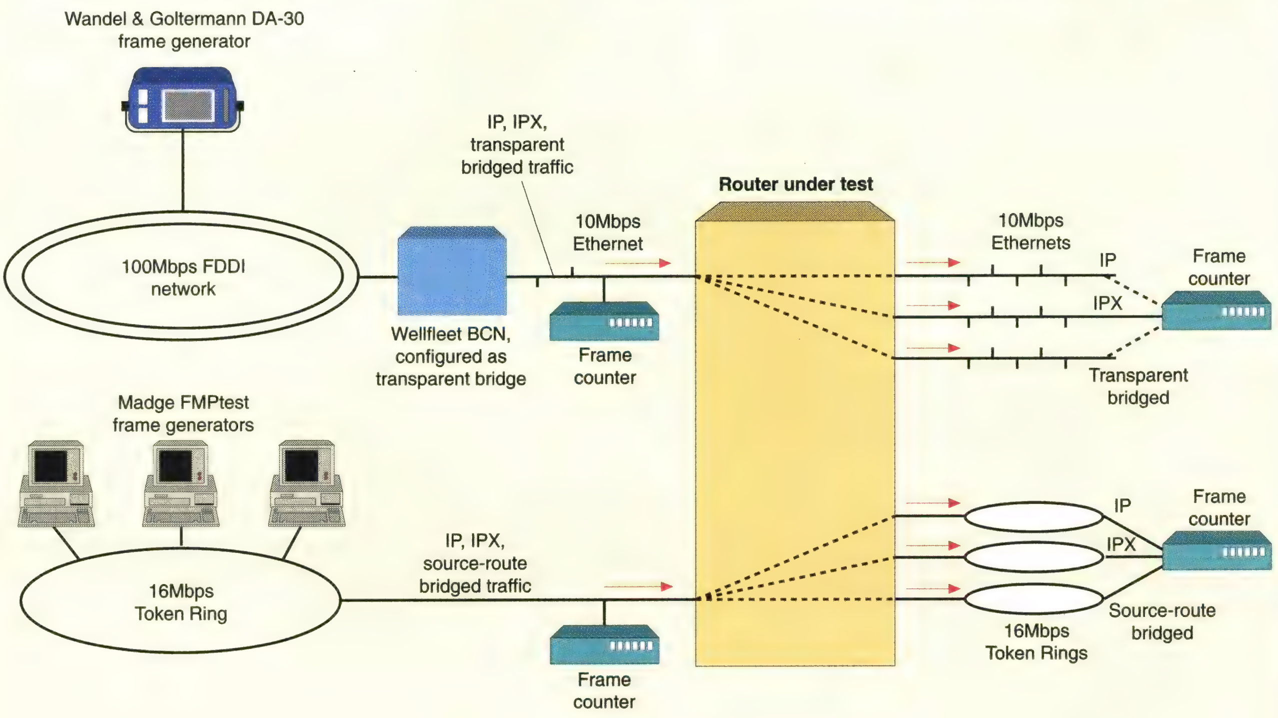
Vendors seem to be getting the message. Of the routers we tested, NSC, Retix, 3Com, and Wellfleet offer redundant power supplies, ensuring an instant transition if one power supply fails. 3Com and Wellfleet also offer what the Lab considers to be truly hot-swappable interface cards. This means that it's possible to pull a faulty adaptor and replace it without powering down the router or bringing other cards off-line. Interface cards can also be removed from an active Retix router, but only after the network manager performs a software partition that isolates the failed card. The other routers in this test offered no hot-swap capabilities at all.

As the Lab has reported in other tests, router installation and configuration can be something of a black art, and we're sorry to report that vendors seem to be doing their best to keep it that way. To be fair, we should point out that routers are inherently complex devices, and vendors will usually send a systems engineer to assist in a first-time installation. Nevertheless, the intricacies of hardware installation can stump even the vendors' own engineers, as we saw for ourselves. With one of the boxes, the system engineer could enable routing or bridging, but not both. And even with less daunting problems, vendor representatives won't be on-site when there's trouble.

Assuming that network managers emerge more or less unscathed from the hardware setup, they then must wrestle with a router's exhaustingly complicated configuration routines. At the very least, configuration software gives four pieces of information to each router port that is enabled: topology, cabling, networking protocol, and routing protocol. For example, a router setup routine might tell a port, 'Use Ethernet, 10Base-T cabling, IPX protocol, and RIP.' Of course, there are several possible choices for each category, and it's likely that one port will support multiple networking protocols.

Of the routers we tested, 3Com's configuration software stands out as the most straightforward. Multiple ports can be set up simultaneously on the company's NetBuilder II, and the number of choices a net manager must make is kept to a minimum.

Figure 1: The Test Bed



The Data Comm Test Lab invited 14 vendors to submit products for this test: Advanced Computer Communications (ACC); Alantec; Ascom Timeplex; Cisco Systems; Coral Network Corporation; Crosscomm; Digital Equipment Corporation; IBM; Network Systems Corporation; Proteon; RAD Network Devices; Retix; 3Com; and Wellfleet Communications. Of these, five companies accepted: Alantec, NSC, Wellfleet, Retix, and 3Com. Because of Cisco's large market share, the lab obtained a Cisco AGS+ from a large financial institution for use in this test.

To evaluate the effects of protocol interaction, we built a test bed with three elements: a source LAN to generate traffic, the router under test, and three destination LANs. We chose the one-in, three-out configuration because our test involved three traffic types — IP, IPX, and bridged — and three outputs allowed each stream to be accurately measured.

No Ethernet frame generator proved capable of generating enough multiprotocol traffic to stress the routers. Consequently, we generated test traffic on a FDDI network using a DA-30 analyser and Flexmit-F software from Wandel & Goltermann. We then bridged the traffic onto a source Ethernet LAN using a Wellfleet Backbone Concentrator Node (BCN).

All equipment on the FDDI ring was attached to a Fiberhub 1600 concentrator from Interphase Corporation.

In the Ethernet tests, we used 64-, 512-, and 1,512-byte packets. At each packet size, we sent both single-protocol streams and five different combinations of IP, IPX and transparent bridged traffic. We verified packet size and protocol distribution using an Expert Sniffer from Network General.

The test procedure was to begin generating a relatively low level of traffic and gradually increase the level until we noticed frames were being dropped on the output side. Our main input and output monitor during these tests was a Chameleon Open LAN analyser from Tekelec. All Ethernet equipment was attached to Linkbuilder FMS concentrators from 3Com. In prototyping this test, we also used a Network 9000 Intra-Networking Hub from Xyplex.

In the Token Ring tests, we generated traffic using FMP-test frame generation software from Madge Networks. Three 486-based PCs, each equipped with Madge's Smart 16/4 Ring-node network adaptor cards, were attached to the source ring — one each to generate IP, IPX, and source-route bridged traffic. We used 64-, 512-, and 2,048-byte packets in these tests. We used W&G's DA-30 to monitor traffic levels on both input and output sides of the router and verified protocol distributions with Network General's Expert Sniffer.

Wellfleet's Site Manager, on the other hand, remains one of the most difficult configuration packages to use. Features that logically should appear together often are separated by several layers of submenus, and the BCN's vertically aligned interface cards are displayed horizontally on Site Manager's port map.

Given what passes for state-of-the-art when it comes to configuration, it's a good thing that routers don't have to be reconfigured every day. But they do have to be managed, and in this area vendors are at least delivering the basics.

All the routers we tested can be managed both through SNMP systems — via MIB (managed information base) agents — or through direct terminal connections via EIA-232 ports. The latter also allow remote dial-up. Given that these products will typically be deployed at central sites, remote dial-up is not as important as it would be in, say, a branch-office router. Still, it can come in handy. The 3Com, Cisco, NSC, and Wellfleet routers can be upgraded via remote dial-in, and the 3Com router also allows central-site configuration settings to be downloaded to the vendor's branch office routers (which it calls 'boundary routers').

Design Challenges

In addition to performance and reliability, net managers also are concerned with how well suited a router is to their internetwork. In fact, before they even glance at a vendor's spec sheets, they've got to figure out how much traffic they have on their networks, how the traffic flows, and whether the internetwork should be managed from a central location. Once they've got this information in hand, they're ready to assess a vendor's design philosophy.

Some vendors advocate a collapsed-backbone approach, in which all LAN segments tie into a central backbone. This needn't be a physical segment; Cisco, NSC, and Wellfleet attach all LANs to one central router and use that router's backplane to create a backbone in a box. The problem with this approach is that it creates a single point of failure. But as central-site routers are increasingly equipped with fault-tolerant features, risks will be much reduced.

Because of their relatively low number of ports, Alantec, Retix, and 3Com take a distributed approach to routing; these vendors deploy units around the network, each of which handles a portion of the routing chores. The downside to this scheme is that distributed routers tend to under-perform their central-site counterparts.

As always, price plays a major role in determining which high-end router to buy. But meaningful comparisons can be elusive. Routers are sold on a component basis, so the final cost will depend on the number of interface cards, management modules, and power supplies purchased. Even when specifying prices for a fixed configuration, there's plenty of room for differences. The most useful guideline for network managers may be to figure out a per-port price for all the routers needed in a given situation. That ensures a level playing field.

The Lab also ran extensive hands-on performance tests on each router involving 12 Ethernet and Token Ring LANs, seven different hubs, four frame generators, 48 different combinations of test traffic, and more than 550 hours of testing. For all their complexity, though, most of our tests sought to answer a single question: How are routers affected by servicing multiprotocol streams?

To establish performance benchmarks, we began by offering each router pure streams of the three traffic types most commonly found on corporate networks — IP, IPX, and bridged traffic. (We used transparent bridged traffic in our Ethernet tests, and source-route bridged traffic in the Token Ring trials.)

As is standard practice in all of our bridge and router tests, we first offered each device under test a small amount of traffic and gradually increased the level until we noted packet loss on the output side (see Figure 1 on page 91). Once we had established benchmarks for one protocol stream, we sent various combinations of the three traffic types and noted how throughput compared with that of single-protocol streams. It should be noted that although we enabled six ports on each router, all devices under test used a one-in, three-out configuration.

Running The Numbers

The test results for Ethernet showed slower data rates for 64-byte packets than for other sizes, typically topping out at around 7-Mbps (see Figure 2 on page 94). This was as expected: at most, Ethernet can handle 14,880 pps; with 64-byte frames, that translates into a maximum possible data rate of 7.62Mbps. (The balance of Ethernet's 10-Mbps bandwidth is claimed by overhead such as interframe gaps and packet preambles.) The 7.62Mbps rate itself is a theoretical limit, since it supposes one-way traffic and thus no packet loss resulting from collisions. Our test equipment offered each router a maximum of 14,000pps — which translates to a data rate of 7.17Mbps. Even that is higher than would be found on any real-world Ethernet, where the basic rule of thumb is: if you've got more than 6Mbps, you've got problems.

Heavily loaded or not, most routers proved capable of handling multiprotocol traffic with relatively little degradation. Wellfleet's BCN, for example, passed all combinations of traffic at an average speed of 7.12Mbps, which is only 50Kbps shy of the most we could offer. Further, the BCN's results across all the 64-byte packet tests varied by just 1% — a strong indication that mixed traffic won't be a problem for BCN buyers.

Of the other vendors, Alantec, 3Com, and Cisco also posted numbers at or close to the top end. Alantec's results, like Wellfleet's, varied by just 1% across all tests, and its average data rate was just 30Kbps slower than Wellfleet's. 3Com's NetBuilder II also was extremely consistent across most tests, handling data at top speed in seven of our eight protocol distributions.

Cisco's AGS+, rather than being slowed down by multiprotocol streams, actually ran up to 20% faster when handling a 50-50 mix of IP and IPX than pure streams of either protocol. This phenomenon occurred a few times during our tests, and no vendor was able to explain it adequately. (Configuration problems prevented us from testing Cisco's router with transparent bridging enabled. This made it impossible to combine all three traffic types in the Ethernet evaluations.)

The NSC and Retix routers proved most susceptible to multiprotocol streams. NSC's 6800 Series router heavily favored IP traffic, topping out at nearly 7Mbps when handling pure IP streams. But performance fell off as more IPX and bridged traffic was added, bottoming out at 3.35Mbps for a mix consisting of 67% bridged and 16% each of IP and IPX. Retix's Routerxchange 7500, in contrast, favored bridged traffic: it topped out at more than 7Mbps when the mix included 50% or more bridged traffic, but performance fell to 4.35Mbps for a 50-50 mix of IP and IPX.

There was far less performance degradation with larger packets. At 512 bytes, for example, the routers we tested showed almost no differences with various protocol mixes (see Figure 3). Of 43 total data points, only one is lower than the maximum possible rate of 9.42Mbps. The lone variation belongs to NSC's router, which, as in the 64-byte packet tests, slowed down when handling mostly bridged traffic.

And with 1,500-byte packets, there's virtually no difference between vendors (see Figure 4). True, NSC's router did post results slightly lower than the maximum possible 9.84Mbps — but this is just 3% slower on average than the other units, which is not enough to be significant.

Testing Token Ring

Our Token Ring tests showed very little performance fall-off for any packet size. Even with 64-byte packets, throughput remained remarkably consistent. But there were notable differences in performance. Two of the routers we tested — Cisco's and Wellfleet's — passed 64-byte packets in the 11Mbps range, about 5 times faster than the average rates posted by NSC and 3Com (see Figure 5). Cisco's AGS+ delivered the highest single packet rate in the entire test, sending a 50-50 mix of IP and source-route bridged traffic at approximately 23,000pps, or nearly 12Mbps. And Wellfleet's BCN, as in the Ethernet tests, posted the highest average throughput (11.1Mbps) across all protocol distributions. (We should note here that because of limitations of our test equipment, any rate above 17,000 pps is accurate only within 10%; at lower rates, results are accurate within 2%.)

For NSC and 3Com, the small-packet Token Ring results can charitably be described as dismal. Here, the problem wasn't multiprotocol streams but simply poor performance. Both vendors averaged just 2.2-Mbps across all protocol distributions.

NSC and 3Com also under-performed Cisco and Wellfleet in the 512-byte tests, (see Figure 6). Cisco and Wellfleet posted nearly identical averages of more than 15-Mbps, while NSC and 3Com hovered in the 10-to-11Mbps range. Curiously, both the NSC and 3Com routers showed greater performance degradation with 512-byte packets than they did with small packets. As in some of the Ethernet tests, both vendors' routers handled mixed-protocol streams more efficiently than single-protocol ones. Unlike the Ethernet tests, however, NSC's router offered slightly higher performance as IP traffic was removed from the mix.

When it came to handling 2,048-byte packets, all four routers came closest to the ideal of maximum performance regardless of protocol mixtures (see Figure 7). All except NSC turned in average speeds of 15.6Mbps or better, a rate that verges on Token Ring's 16Mbps limit. The only router to exhibit any performance fall-off was NSC's, which slowed to around 12.2Mbps when handling pure streams of IP or IPX. Without those two data points, however, NSC's average speed topped 15.5Mbps, which put it in a virtual dead heat with the other vendors in the test.

Alantec

'Fast, but limited' might be a good way to describe the Alantec Powerhub. We were impressed by its performance and relatively easy configuration but wished for more features, both in hardware and software.

Alantec offers routing features across its entire line of Powerhubs. We tested the top-

Communicate At Breakthrough Speeds.

Get AT&T's SYSTIMAX® Structured Cabling Systems, And Get Speeds Beyond 100 Mbps.

Over copper. Or fibre. Your network can now have unprecedented speed and interoperability. All by installing AT&T's SYSTIMAX Structured Cabling Systems, with our HIGH-5™ product family of Category 5 components. They support today's network applications and emerging technologies like ATM, up to speeds of 155 Mbps. And this total solution offers you end-to-end connectivity, maximum network compatibility and the ability to evolve your network as your future needs change. All from a single, reliable source.

AT&T's HIGH-5 products come with a 15-year extended product warranty and system assurance, and they exceed EIA-568 Category 5 specifications.

The copper cabling was created by AT&T Bell Laboratories and has become the benchmark for Category 5 standardisation testing.

So find out how AT&T's SYSTIMAX Structured Cabling Systems can help you break through communications barriers. Call us on **008 804 738.**

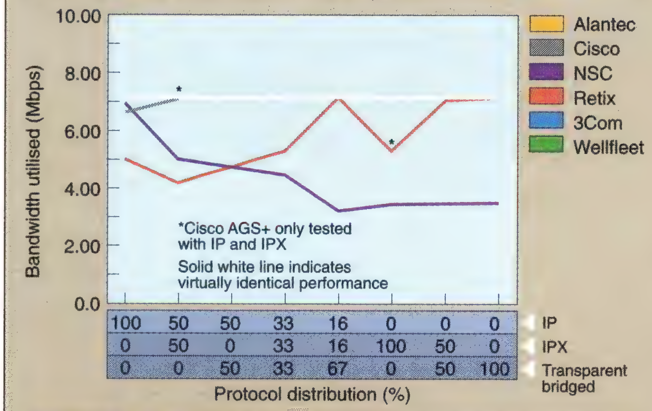
AT&T Network Systems And Bell Laboratories. Technologies For The Real World.

AT&T
Network Systems

© 1993 AT&T ATT3012

Figure 2: Multiprotocol Performance

Ethernet, 64-byte packets, 1 input/3 outputs

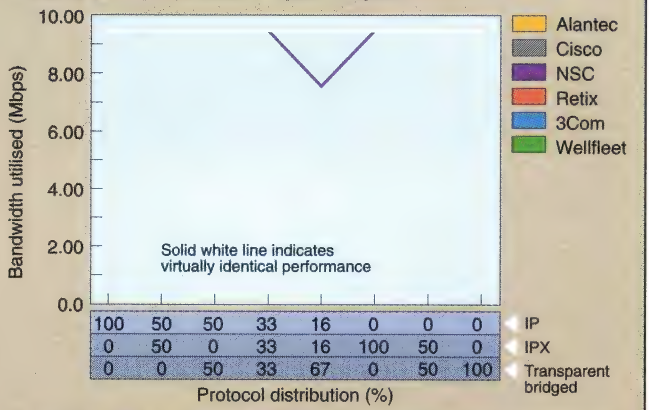


*Cisco AGS+ only tested with IP and IPX

Solid white line indicates virtually identical performance

Figure 3: Multiprotocol Performance

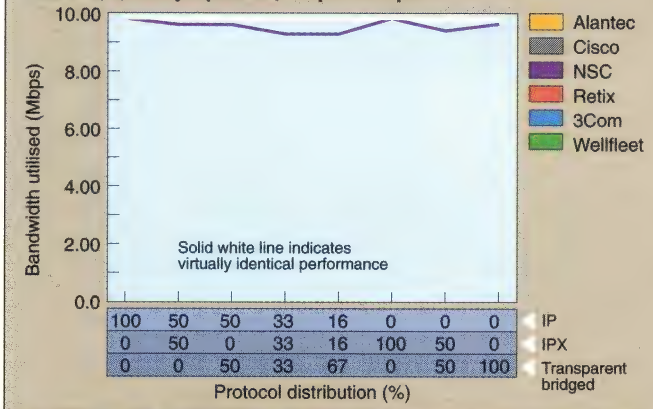
Ethernet, 512-byte packets, 1 input/3 outputs



Solid white line indicates virtually identical performance

Figure 4: Multiprotocol Performance

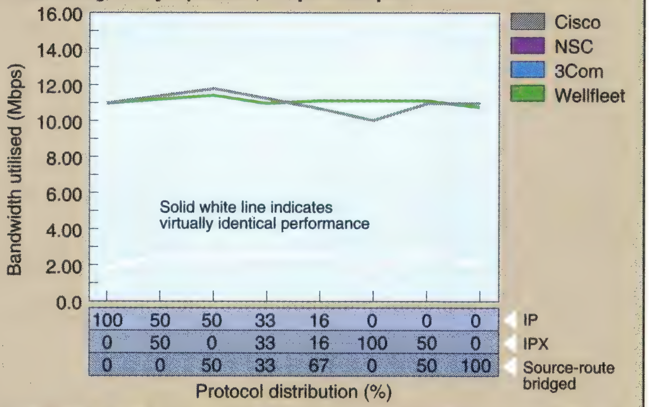
Ethernet, 1,512-byte packets, 1 input/3 outputs



Solid white line indicates virtually identical performance

Figure 5: Multiprotocol Performance

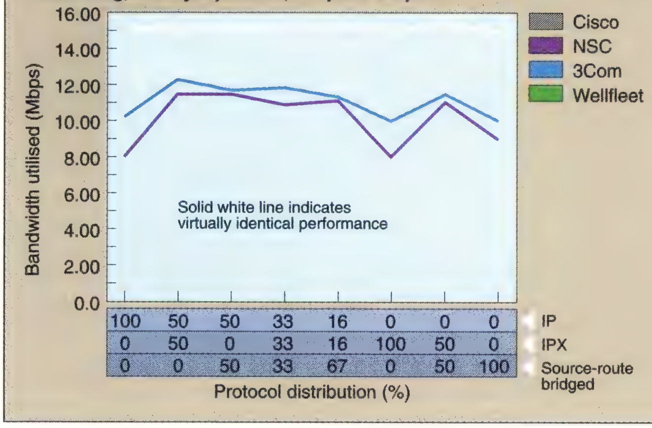
Token Ring, 64-byte packets, 1 input/3 outputs



Solid white line indicates virtually identical performance

Figure 6: Multiprotocol Performance

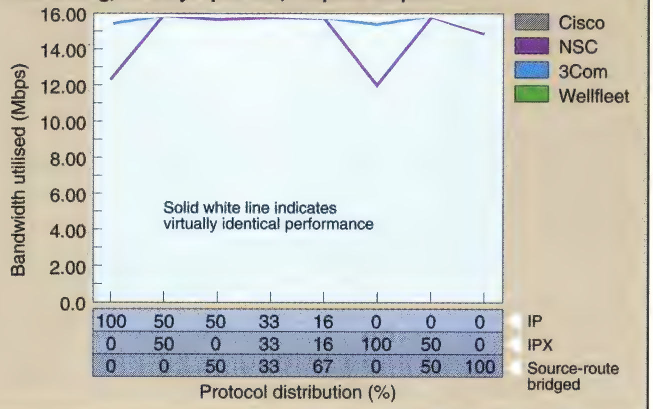
Token Ring, 512-byte packets, 1 input/3 outputs



Solid white line indicates virtually identical performance

Figure 7: Multiprotocol Performance

Token Ring, 2048-byte packets, 1 input/3 outputs



Solid white line indicates virtually identical performance

end Model 3500, which supports 12 Ethernet and four FDDI segments. On the Ethernet side, the Powerhub 3500 supports a total of 36 connections via RJ-45 interfaces; each group of three interfaces shares access to one 10Mbps segment via repeaters.

Those are suitable numbers for central-site installations, especially when connecting Ethernet LANs to FDDI backbone networks. But the Powerhub is available only in a fixed configuration: users cannot add more interfaces, and hot-swapping of failed interfaces is not possible. What's more, the Alantec router lacks fault-tolerant features such as redundant power supplies.

Alantec's routing software, while delivering excellent performance, suffers from limited protocol support. IP, IPX and DECnet are the only networking protocols supported; many competing vendors support many more, including OSI, Vines, DLSw (Data Link Switching), and Appletalk.

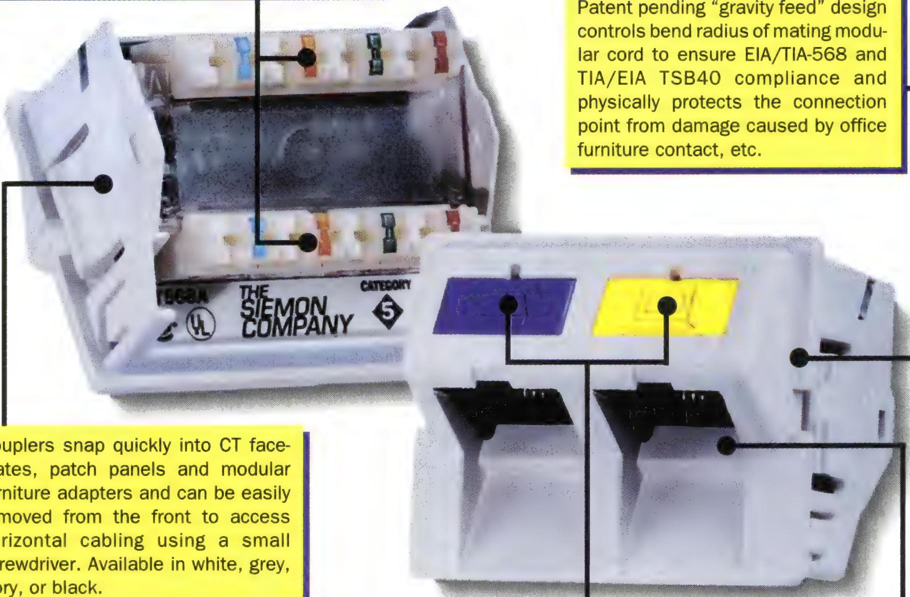
Another shortcoming is the fact that the vendor does not support Token Ring. But where these limitations aren't an issue (after all, IP and IPX are by far the most commonly used protocols), the Powerhub proved more than adequate at routing.

In our Ethernet tests, the router handled the maximum offered load in most tests. Even where it didn't hit top speed, it fell short of the maximum offered load by an insignificant margin.

Cisco Systems

As the long-time leader in the router market, Cisco is considered by many to set the standards against which other products are

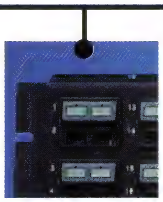
A New ANGLE *On Category 5 Compliance*

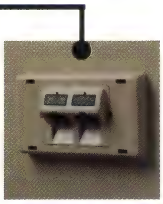


Equipped with Siemon S110 connectors and patent pending "pair balance" technology.

Patent pending "gravity feed" design controls bend radius of mating modular cord to ensure EIA/TIA-568 and TIA/EIA TSB40 compliance and physically protects the connection point from damage caused by office furniture contact, etc.

Couplers snap quickly into CT faceplates, patch panels and modular furniture adapters and can be easily removed from the front to access horizontal cabling using a small screwdriver. Available in white, grey, ivory, or black.





Snap-in colour-coding icons allow users to instantly identify different types of services (Voice, 10BASE-T, Token Ring, etc.) Nine colours available.

Other options include a single jack configuration and spring shutter doors for jacks.

This is the highest quality Category 5 component made. Unique engineering innovations ensure full featured end-to-end Category 5 connectivity. It works in the wiring closet. It works at the work area. It works with modular furniture. No other product offers comparable flexibility, performance and value.

THE SIEMON COMPANY

MADE IN U.S.A

**CALL NOW
FOR THE LATEST
SIEMON CATALOGUE
OR DETAILS OF
YOUR NEAREST
DISTRIBUTOR.
(612) 905-9468
FAX (612) 905-9471**

measured. Indeed, the router we tested offered blazing performance, extensive protocol support, and plenty of ports — and it's not even the vendor's top-of-the-line model.

In our performance tests, Cisco handled the maximum offered load in just about every case. In fact, the router's throughput actually rose when we offered multiprotocol streams over Ethernet.

The AGS+ has two backplane buses; a 16-Mbyte Multibus handles connections between two- and four-port Ethernet and serial interfaces, and a 528Mbps cBus handles six-port Ethernet and FDDI interfaces. Routing tasks are split between bitslice processors on the high-speed interfaces and a 25MHz 68040 CPU from Motorola.

This combination allows up to 28 Ethernets or Token Rings to be linked. Cisco also supports a wide array of FDDI and WAN interfaces, and its list of supported protocols is among the longest in the industry.

Not everything about Cisco's AGS+ was perfect, though. The router lacks fault-tolerant features. Cisco's current top-end router, the model 7000, does offer full fault tolerance, but both routers share the same unforgiving configuration software.

We were unable to configure the router for transparent bridging over Ethernet, and the vendor's technical support personnel were unable to diagnose the problem.

Another fault with the AGS+ is its construction. Most central-site router designs involve a chassis that houses a backplane bus and cards that slot into the chassis, making for a nice, neat modular design. The AGS+, in contrast, uses ribbon cables to tie everything together. The tangle of ribbon cables in a fully loaded AGS+ could lead to mistaken connections, especially in emergencies when an interface card fails. Cisco's Model 7000 does not use ribbon cables.

Network Systems Corporation

We were disappointed with NSC's results. The company's Model 6800 looks like a heavy-duty central-site router, with its large (13 slot) chassis and RISC-based scalable architecture. Alas, the NSC router didn't deliver performance to match.

In our small-packet Token Ring tests, NSC's performance trailed Cisco's and Wellfleet's by nearly a 5:1 ratio. And in our small-packet Ethernet tests, the Model 6800 heavily favored IP traffic; as IPX or bridged traffic increased, performance fell off dramatically. We expected to see better results in a router that features an 800Mbps backplane and an AMD 29000 RISC processor on each interface card. Still, NSC's router may be a good fit in Ethernet or FDDI environments with lots of IP traffic. The router handles up to 56 LAN attachments, the highest of any vendor in this test. Configuration via an ASCII terminal was fairly straightforward, and remote dial-up configuration was possible.

NSC has seen fit to acknowledge its Token Ring limitations. The vendor has pledged to move to the Packetblaster Token Ring accelerator chip from Texas Instruments as soon as it becomes available in production quantities.

Retix

One of the world's leading suppliers of OSI products, Retix is a relative newcomer to the high-end router market. As such, the Routerxchange 7500 showed some room for improvement, particularly when it came to handling multiprotocol streams and protocol support. In other areas, however, we found much to like about the company's router: RISC-based scalable architecture, relatively simple configuration, and excellent integrated diagnostic tools.

The Retix router was one of the products in our test to handle some types of traffic better than others. With 64-byte packets over Ethernet, the Routerxchange worked best as a bridge; it fielded pure IPX slightly slower than bridged traffic, and routed IP slower still. Performance picked up dramatically with larger packets, though. Retix took all the 512- and 1,500-byte packets we could offer. The company also sells Token Ring interfaces, but did not supply any for these tests.

The Routerxchange 7500 has a modular architecture. Each interface board has its own Intel i960 RISC processor, and separate processors are dedicated to packet forwarding and management tasks. Further, the router offers built-in bit error rate test (BERT) and loopback test capabilities — a major plus for troubleshooting problems on serial lines.

On the downside, Retix's router doesn't support as many protocols as market leaders Cisco, Wellfleet or Proteon. And we found the vendor's hot-swap capabilities to be limited; before changing interface cards, network managers must first perform a software partition around the failed interface. Although Retix sells Token Ring interfaces for its Routerxchange 7500, it did not supply these to the Lab.

3Com

The good news is that 3Com's Ethernet LAN expertise really shines through in its NetBuilder II router. That's also the bad news. In our Token Ring tests, the NetBuilder II's performance was sluggish at all but the largest packet sizes.

In terms of features, though, the NetBuilder can't be beat. The router supports virtually all major networking protocols and all LAN and WAN interfaces. 3Com also earned points for its clear, concise configuration software. The menu-driven software allows attributes to be set across multiple ports, a plus when it comes to complex setups. The NetBuilder II chassis is sold in four-and eight-slot versions that accommodate up to 16 Ethernet or eight Token Ring interfaces.

The router's rugged interface cards are the easiest to hot-swap of any router in this test. All interface cards connect via an 800-Mbps backplane, and all processing is performed by an AMD 29000 RISC chip.

3Com's router flew through our Ethernet performance tests, handling all the data we could offer in most instances. On Token Ring, however, 3Com matched NSC in delivering about a fifth as much bandwidth as routers from Wellfleet and Cisco.

Wellfleet Communications

Simply put, Wellfleet's Backbone Concentrator Node (BCN) was the most well-rounded router in this round of Lab testing. The BCN's combination of uniformly high performance, scalar architecture, extensive protocol support, and full fault tolerance brought it closer than any other product to our ideal of what a high-end central-site router should offer.

In terms of performance, the BCN always ran at top speed in our tests. Small packets, large packets, IP, IPX, Ethernet, Token Ring — whatever combinations of traffic we offered, the BCN handled without flinching.

The BCN's 13-slot chassis supports up to 52 Ethernet or Token Ring LANs. Interface cards connect to dedicated routing engines via a 1Gbps midplane. Each routing engine has its own 25MHz Motorola 68040 processor.

In addition to Ethernet and Token Ring support, Wellfleet also offers the full complement of FDDI and WAN interfaces. When it comes to fault tolerance, Wellfleet supports hot-swappable interface cards and redundant power supplies; in fact, it's the only vendor in this test to offer quadruple power supplies as an option.

As we've noted in past tests, one area where Wellfleet does not shine is in its configuration software. The vendor's Site Manager software requires ports to be configured on an individual basis, which means network managers sitting down to set up a fully loaded BCN had best be prepared for a long day's work. And despite its graphical interface, Site Manager forces net managers to navigate through a seemingly endless series of menus. Granted, the Wellfleet router offers one of the most comprehensive feature sets of any router today; but Site Manager's hurdles stand between the user and many of those features.

Kevin Tolly is Director of the Data Comm Test Lab and President of Interlab. He is based in Sea Girt, New Jersey. David Newman is Testing Editor for Data Communications magazine, based in Boston.

The Future is Now:

MOD-TAP HIGH PERFORMANCE

SYSTEM 100

100 Mb/s Guaranteed
MOD-TAP®
Category 5 Compliant

MOD-TAP *System 100*, a family of high performance Unshielded Twisted Pair (UTP) and fiber products designed to take your cable plant into the 21st century.

UTP products are available to meet EIA/TIA 568 Category 5 standards for applications which operate at up to 100Mb/s. We have achieved full Category 5 compliance (over all four pairs) by inducing a phase shift of the unwanted NEXT signal. We have combined independent compliance tests with our legendary quality and support services to provide one of the highest performance, feature rich solutions available today.

Fiber products are available to support all applications. Products exist for mode and multimode technologies. All of the most common and standards-compliant connectors are supported.

System 100 products include a wide variety of wall outlets, cross connects, and cables for use in virtually any application and environment. All our cabling products are AUSTEL approved for your security.

The key to *System 100* is integration. We have combined both technologies - fiber and high performance copper - into a single, easy-to-use, system. We believe that in the cable plant of the future, demarcation between these two technologies will disappear. MOD-TAP recognizes that the cable plant of the future will be an integrated UTP and fiber system that can be managed as a single entity. The future is now - System 100. Call us before your next cabling installation.

MOD-TAP®

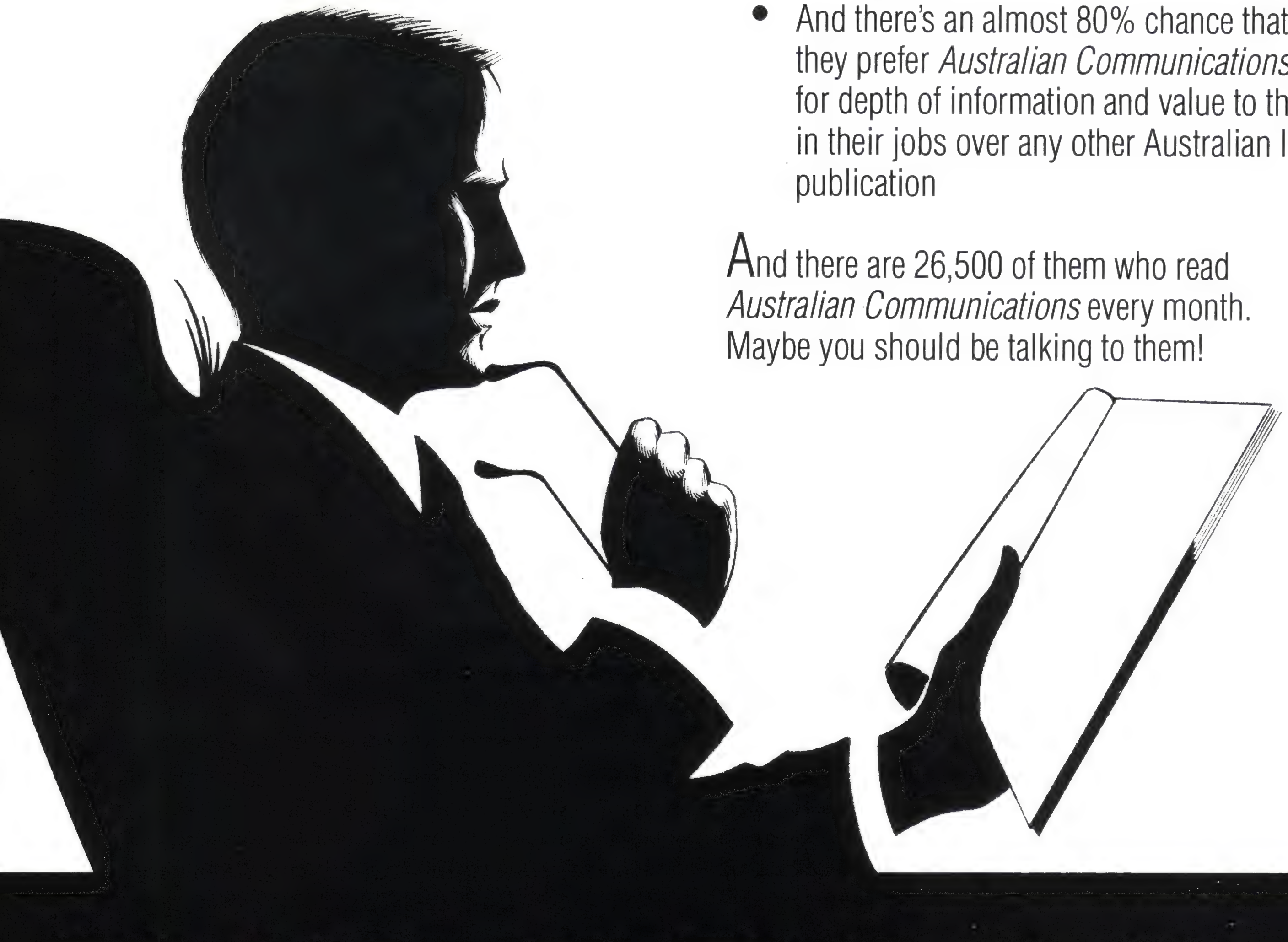
MOD-TAP (Australia) Pty Ltd
86 - 100 High Street, Melton, Victoria 3337. Tel:(03) 747 8322. Fax:(03) 747 8627.

DISTRIBUTED BY: NSW: Modular Networks Pty Ltd, (02) 949 2844. **QLD:**Cable & Connector Wholesale Pty Ltd, (07) 273 7088.
SA: Neil Muller Pty Ltd, (08) 272 8011. **VIC:**Stronglink Pty Ltd, (03) 427 7133. **WA:**Datacomm Pty Ltd, (09) 242 4766.
ACT: Modular Networks Pty Ltd, (06) 280 7155. **NZ:**Connector Systems, 64 9 774945.

Who is an *Australian Communications* Reader?

- There's a better than even chance that they work for a company with over 500 employees
- There's a 70% chance that they authorise or specify the purchase of data networking products
- It's even money that they run a Novell network or will purchase one in the next 12 months
- There's a 70% chance that they are running Windows or will be in the next 12 months
- And there's an almost 80% chance that they prefer *Australian Communications* for depth of information and value to them in their jobs over any other Australian IT publication

And there are 26,500 of them who read *Australian Communications* every month. Maybe you should be talking to them!



***All statistics are based on the response to the August 1993 *Australian Communications* readership survey conducted by Price Waterhouse, and *Australian Communications'* Audited Paid Circulation.**

For a copy of the complete survey results please contact Craig Burkill or Dawn Switzer on (02) 264 2200.

Price Waterhouse

Kevin Tolly and
David Newman

How Accurate is Your LAN Analyser?

All the bells and whistles loaded onto a network analyser aren't worth much if the box can't do its main job properly. The latest round of testing reveals that accuracy can vary widely.

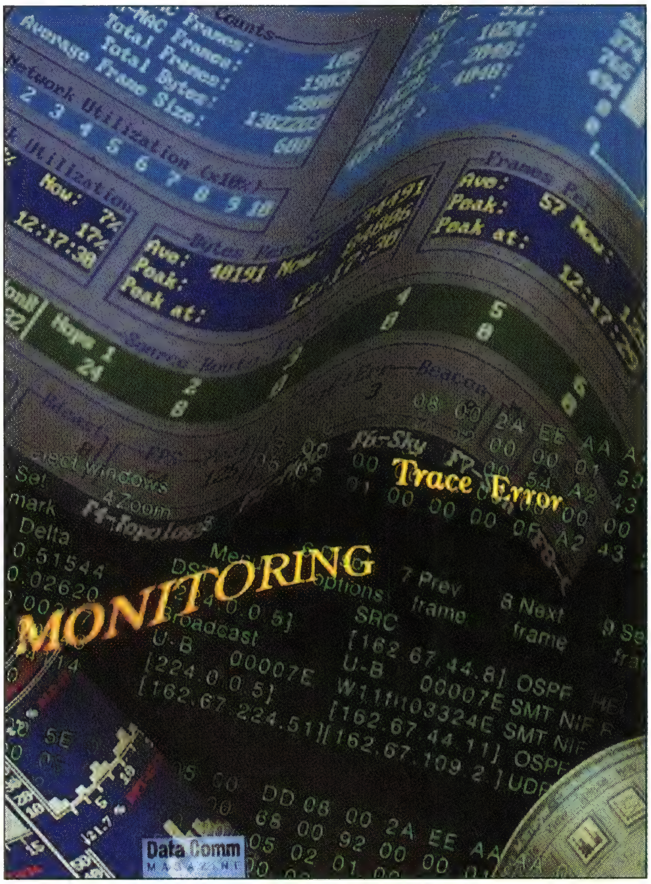
Maybe your wristwatch boasts a glow-in-the-dark dial — just the thing for those lights-out data centres. Maybe it came complete with a calculator or sounds a beep when your blood pressure reaches the red zone. Who knows, it may even put Dick Tracy's two-way wrist radio to shame. But if it can't keep accurate time, all its flashy features and functions aren't going to be of much use.

It's pretty much the same thing when it comes to LAN analysers. Accuracy — the highest rate that an analyser can work at and still keep correct counts — is of paramount importance. Regardless of the task at hand — monitoring traffic levels, finding errored packets, or stress-testing devices and networks — an analyser is only as good as the numbers it reports. That's why the Data Comm Test Lab made accuracy the No. 1 issue in its latest look at LAN analysers. We tested 11 products — nine analysers and two frame generators — on Ethernet, FDDI, and Token Ring to see what sort of performance they could deliver. We also evaluated capture/decode capabilities — particularly in terms of protocol support and trend statistics.

Our tests confirmed what we've long suspected: accuracy varies widely from analyser to analyser. Working with a generous two percent margin of error, we found that some analysers report erroneous information even on lightly loaded networks. Worse yet, they offer no indication that their counts are off. The most severe problems were on Token Ring LANs, where most analysers stopped reporting accurately when bandwidth utilisation rose above one-third of capacity; in the frame generation tests, most analysers could only operate accurately at one-sixth of wire speed. Monitoring problems were far less pronounced on FDDI and Ethernet networks, where most products kept accurate counts at rates approaching wire speed. However, frame generating capabilities varied widely on both topologies.

We don't mean to imply that all analysers must be 100% accurate in all situations or excel at every conceivable function. A tool intended primarily for monitoring, for example, probably won't generate frames as quickly or accurately as a box built for that purpose. But every analyser should deliver a basic set of functions — and it should report accurately on each.

We also found a couple of solid performers. The Network Advisor from Hewlett-Packard's Network Test Division handled even high rates of Token Ring traffic with ease, and its monitoring and decoding features were hard to beat. We were equally impressed with the LANpharaoh from Azure Technologies, which combined good performance with a very attractive price. Each of these boxes nabs a Tester's Choice award for this round.



Four Product Categories

Basically, the products we tested fell into four categories. Software-based analysers like LANpharaoh from Azure Technologies; Foundation Manager from Protools; and LANdecoder, Ethervision, and Tokenvision from Triticom, are typically used by LAN managers

A Sampling of LAN Analysers

	PRODUCT [RELEASE]	TOPOLOGIES	TOKEN RING CHIP SET/ DOWNLOAD	PC-BASED	OPERATING SYSTEM
SOFTWARE-BASED ANALYSERS					
Azure Technologies INS 906 6335	LANpharaoh [4.19c]	Ethernet, Token Ring	TI TMS380/TI FPA and proprietary microcode	Yes	DOS
Protools Ungermann-Bass (03) 696 2006	Foundation Manager [1.3.2g]	Ethernet, Token Ring	TI TMS380/IBM Tropic	Yes	OS/2 2.1
Triticom Force Technology (02) 971 1000	LANdecoder/e and LANdecoder/tr (analysers/frame generators) [2.0]; Ethervision and Tokenvision (monitors) [2.0]	Ethernet, Token Ring	Depends on adaptor	Yes	DOS
MIDRANGE ANALYSERS					
Hewlett-Packard 13 13 47	Network Advisor [A.04.01]	Ethernet, FDDI, Token Ring	TI TMS380/proprietary (monitoring); TI Eagle-mac 2.0 (generating)	No	DOS
Network General (02) 911 7770	Expert Sniffer [Ethernet Monitor, 1.4; Ethernet analyser, 4.3; FDDI monitor, 1.5; FDDI analyser, 4.3; Token Ring monitor, 1.7; Token Ring analyser, 4.35]	Ethernet, FDDI, Token Ring	TI TMS380/Madge Networks Fastmac	Yes	DOS
HIGH-END ANALYSERS					
IBM 13 24 26	Dataglance [1.1]	FDDI	N/A	Yes	OS/2
Siemens (03) 420 7111	Protocol Tester K1100 [Ethernet, 7.2; Token Ring, 6.2]	Ethernet, FDDI, Token Ring	TI TMS380/TI Mac	No	Proprietary
Tekelec (02) 790 2200	Chameleon 100 [2.0]	Ethernet, FDDI, Token Ring	TI TMS380/proprietary	No	Unix
Wandel & Goltermann (03) 690 6700	DA-30 [3.3]	Ethernet, FDDI, Token Ring	TI TMS380/TI TurboCAF	No	Proprietary
FRAME GENERATORS					
Alantec Comperex (02) 878 5888	Powerbits 3201 [2.4.5]	Ethernet	N/A	No	DOS
LANquest Datamatic (02) 449 8133	Framethrower [3.0]	Ethernet, FDDI, Token Ring	TI TMS380/Madge Fastmac	Yes	DOS

TI = Texas Instruments N/A = Not Applicable

and trouble-shooters. These packages are designed for host PCs, and, since analysers are often taken to trouble spots, a notebook PC is probably an appropriate choice. The Protools and Triticom packages also require Ethernet or Token Ring adaptors. (Note that Network General has acquired Protools; it will continue to sell and support Protools' Foundation Manager.)

We also took a look at two general-purpose analysers: the Network Advisor from Hewlett-Packard and the Expert Sniffer from Network General. These devices have a wide range of uses, including monitoring at the data centre, troubleshooting in the field, and even modelling network traffic during the design process.

Curiously, these midrange LAN analysers were the only ones we tested to put artificial intelligence to work in problem-solving routines.

The third group, high-end analysers, offers even more advanced features. Products like the Dataglance from IBM, Protocol Tester K1100 from Siemens, Chamelan 100 from Tekelec, and the DA-30 from Wandel & Goltermann, typically track traffic at higher rates and analyse more kinds of traffic in more ways than lower-end devices. Further, all the products in this category except IBM's offer simultaneous generate-and-capture capabilities, making it possible to stress-test devices or networks. Alternatively, these devices' multiple ports can be attached to multiple networks. The final category is frame generators. While the Framethrower from LANquest Labs and Powerbits from Alantec are not true protocol analysers, most offer some monitoring and decoding. This gear is mostly used by product engineers, although network managers sometimes rely on them to test capacity or to reproduce error conditions.

Core Criteria

As we've noted in past tests, LAN analyser functions fall into three essential areas: network monitoring, capturing/decoding, and frame generating. Each of these areas has several sub-categories.

Monitoring is one of the most basic analyser functions. Here, accuracy is of paramount importance: there's no point in using an analyser if it can't count. Unfortunately, this was one of the areas in which we observed some serious short-comings. Some of the problems we observed can be traced

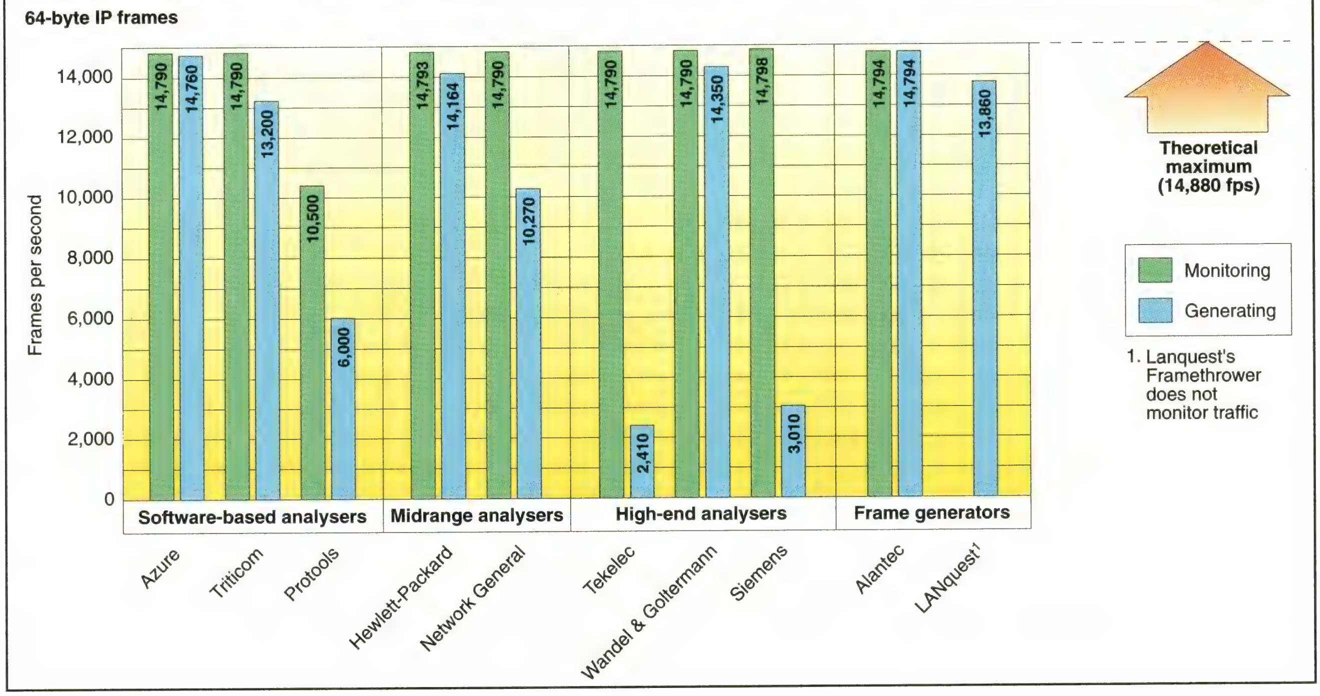


Figure 1: First In, First Out

back to the chip sets and microcode (download) used in the analyser's interface cards. For example, W&G says its DA-30 can monitor Token Ring traffic at 24,000 frames per second (fps), but the highest rate at which it counts *accurately* (within two percent) is just 3,000fps. W&G verified our results and attributed its sluggish Token Ring monitoring to a relatively old release of TurboCAF microcode from Texas Instruments (TI).

But chip sets and microcode aren't always the whole story. Azure's LANpharaoh is the only product in our test to use TI's highly optimised Fast Packet Accelerator (FPA) microcode, but analysers from HP, Network General, Protools, Siemens, and Tekelec were all able to capture frames accurately at higher data rates. In this case, hardware considerations such as processor and bus speed also came into play.

But there's more to monitoring than counting. An analyser must be able to offer information about the frames it's handling. It must warn users if any frames are dropped. And it must be able to track traffic over time to give network managers a picture of utilisation trends. Four of the strongest performers in this area were HP's Network Advisor, IBM's Dataglance, Protools' Foundation Manager, and Tekelec's Chamelan 100. Each offers extensive information in a variety of easy-to-understand formats.

Monitoring also involves flagging problems as they arise. All the products we tested offer some kind of alarm function that sends an alert in response to user-defined conditions; for instance, when network utilisation rises 10% above normal levels. It's also possible to head off problems in the making by combining alarms with filtering, which makes it possible to spot particular kinds of network traffic, such as errored frames. Given the huge variety of errors that can arise — bad frames, protocol errors, illegal addresses (to name only a few) — the large library of predefined filters featured on Hewlett-Packard's Network Advisor and Network General's Expert Sniffer are a definite plus.

Not-So-Secret Decoders

In addition to monitoring local area network traffic levels, an analyser must also be able to capture frames and display their contents. Given the multiprotocol nature of today's LANs, support for TCP/IP, IPX, NetBIOS, DECnet, Vines, AppleTalk, and OSI (among others) is an important asset. Azure's LANpharaoh, Hewlett-Packard's Network Advisor, Network General's Expert Sniffer, Tekelec's Chamelan 100, and Triticom's LANdecoder all accommodated impressive lists of protocols.

But an analyser also must be judged on its ability to decode frame contents and present the results in a form fit for human consumption. Clearly, long strings of hexadecimal data won't be much help in an emergency. What's really needed is commentary about the decoded data, such as what layer is involved (physical, data link, and so on) and what function each byte serves. Sometimes it's necessary to view multiple layers of a decode — a frame's source address (data link layer), for example, alongside its protocol type (network layer). In these instances, a windowed display can be both a lifesaver and an eye-saver. Azure's LANpharoh, Network General's Expert Sniffer, and Triticom's LANdecoder all get high marks for their extensive decode data.

As with monitoring, filters can be used to capture and decode selective frames. For example, an analyser can be set to capture and decode all SAP (Service Advertising Protocol) reply frames on a NetWare LAN — a useful way of determining which servers and printers are active.

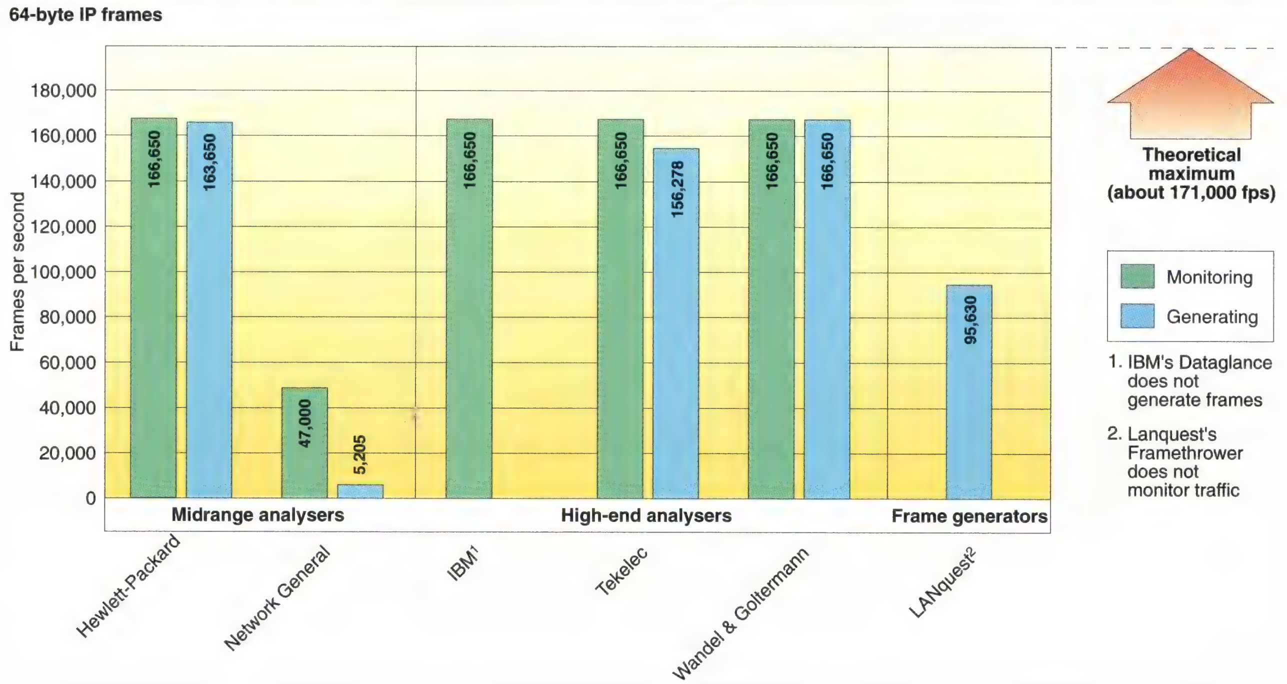
The Frame Game

In addition to the foregoing, analysers also should be able to generate frames onto a network. This makes it possible to test specific devices like servers, bridges, routers, and switches to see how much traffic they can handle. It also allows network managers to see the effects of adding more traffic — more users, more protocols, or more applications — to the network before actually taking the plunge.

Judging an analyser's abilities in this area involves more than raw performance. On Ethernet LANs, after all, real-world network utilisation never approaches wire speed because of packet collisions and network overhead. So simply looking for a frame-blaster doesn't make much sense.

First, a frame generator should be able to send multiple types of frames. Protools' Foundation Manager and Wandel & Goltermann's DA-30 are the clear leaders in this area, each allowing up to 100 different frames to be sent in succession. Second, a frame generator should allow net managers to edit frames. LANquest's Framethrower excelled in this area, allowing frames to be

Figure 2: Monitoring and Generating FDDI Frames



edited as ASCII text and then exported for use by leading analysers. Finally, some products can capture traffic while generating frames — in essence combining frame generating and monitoring to measure network performance. This last capability is offered by Alantec's Powerbits, Azure's LANpharaoh, Hewlett-Packard's Network Advisor, Siemens' K1100, and Wandel & Goltermann's DA-30.

Pitch and Catch

To evaluate analyser accuracy, we looked at two basic functions: network monitoring and traffic generation. In both areas, we sought to determine the highest level at which each analyser could report accurate results. We tested with small and large frames, and we also used a variety of traffic types — IP, IPX, bridge traffic, and combinations of all three.

Our results for Ethernet and FDDI analysers were generally positive. Most analysers monitored traffic and generated small (64-byte) and large (1,518-byte for Ethernet; 4,096-byte for FDDI) frames at high rates. In fact, large-frame rates on Ethernet and FDDI were mostly so close that differences between products were insignificant. Similarly, traffic type didn't seem to matter much on Ethernet or FDDI: when monitoring and receiving frames, changing protocols or even using multiprotocol streams produced remarkably consistent results. Thus, we are presenting Ethernet and FDDI performance results only for 64-byte IP traffic; results for other frame sizes, protocols, and protocol distributions were identical in all but a few cases.

In the Ethernet tests, many analysers came close to the technology's 14,880fps maximum when monitoring and generating frames (see Figure 1 on page 101). Even the lowest score in monitoring — 10,500fps by Protools' Foundation Manager — represents a data rate of 5.38Mbps, which is higher than that found on most real-world Ethernets.

On the sending side, some of the lowest traffic generation scores came from high-end analysers such as Siemens' K1100 and Tekelec's Chamelan 100.

The FDDI tests showed more variety, although analysers from HP, IBM, and W&G counted traffic at rates approaching wire speed (see Figure 2). These achievements are critical, since full bandwidth utilisation on FDDI is a real possibility, not just a theoretical one. The products that couldn't perform at top speed — Network General's Expert Sniffer and LANquest Lab's Framethrower — may not be able to keep up with the demands of FDDI networks.

Token Ring Troubles

The most serious problems turned up in our Token Ring tests: all vendors' monitoring and generating rates for small frames (64 bytes) fell far short of wire speed. What's more, a few products handled multiprotocol mixtures far more slowly than they did single-stream traffic. And there were significant differences between vendors' results in both the monitoring and the generating tests.

As we've said many times before, these shortcomings are largely attributable to limitations of Token Ring chip sets and microcode. Those limitations are especially crippling in test devices, since they may make it impossible to get an accurate gauge of network performance. And even if it seems logical that all analyser vendors would leap to adopt the latest in high performance Token Ring technology, that's not the case. Most vendors simply concede that Token Ring performance is not their strong suit.

However, one notable exception is Protools, which announced at press time that it is beta-testing a driver for IBM's high performance LANstreamer adaptor. In other tests, we've seen LANstreamers operate at rates approaching Token Ring's 16Mbps wire speed; there's no reason to think that they wouldn't give Token Ring analysers a similar performance boost.

Siemens' K1100 proved the most accurate analyser in our Token Ring monitoring tests, handling 24,000fps with no errors (see Figure 3). HP's Network Advisor also counted at the very high rate of 22,500fps. After that, results fell off sharply. Network General, Protools, and Tekelec each monitored 11,000 to 12,500fps, which represents at best about 40% bandwidth utilisation. Products from Azure, Triticom, and Wandel & Goltermann could only count accurately at 7,500fps or less — hardly ideal considering that this represents less than 25% bandwidth utilisation.

Results were even more underwhelming in the Token Ring frame generation tests, with all products falling far short of wire speeds (see Figure 4 on page 106). LANquest's Framethrower was the leader here, delivering both single-protocol and multiprotocol streams in excess of 20,00fps. Its

For a fresh approach to simultaneous full-rate testing of multiple LANs and WANs, just open a window.

CHAMELEON OPEN
TEKELEC
Tools
Chameleon Desk Top Resources
SMDS Network Statistics – Statistics Summary
Ethernet
Network Statistics
Ethernet Layer Set

Point. Click. And bring up windows that show you the activity in multiple network interfaces. Simultaneously and precisely synchronized.

Tekelec's new Chameleon Open is the first protocol analyzer that can perform full-rate testing of multiple technologies, at the same time. For example, you can troubleshoot SMDS, Frame Relay and three Ethernet interfaces, on the same easy-to-read full-color graphics screen.

When it's time to add new technologies such as ATM, the Chameleon Open is ready. Just add the appropriate Tekelec application modules, and you're up and running. It's the only analyzer that you'll ever need.

The Chameleon Open is available in portable and rack-mounted versions. Both can be remotely controlled from any X-Windows workstation.

ONE PROTOCOL ANALYZER TESTS ALL

SMDS
Frame Relay
ISDN
X.25
ATM
FDDI
Ethernet
Token Ring
TCP/IP
OSI
DECnet
NetWare
AppleTalk
SMT
and more

Let's open up a dialogue.

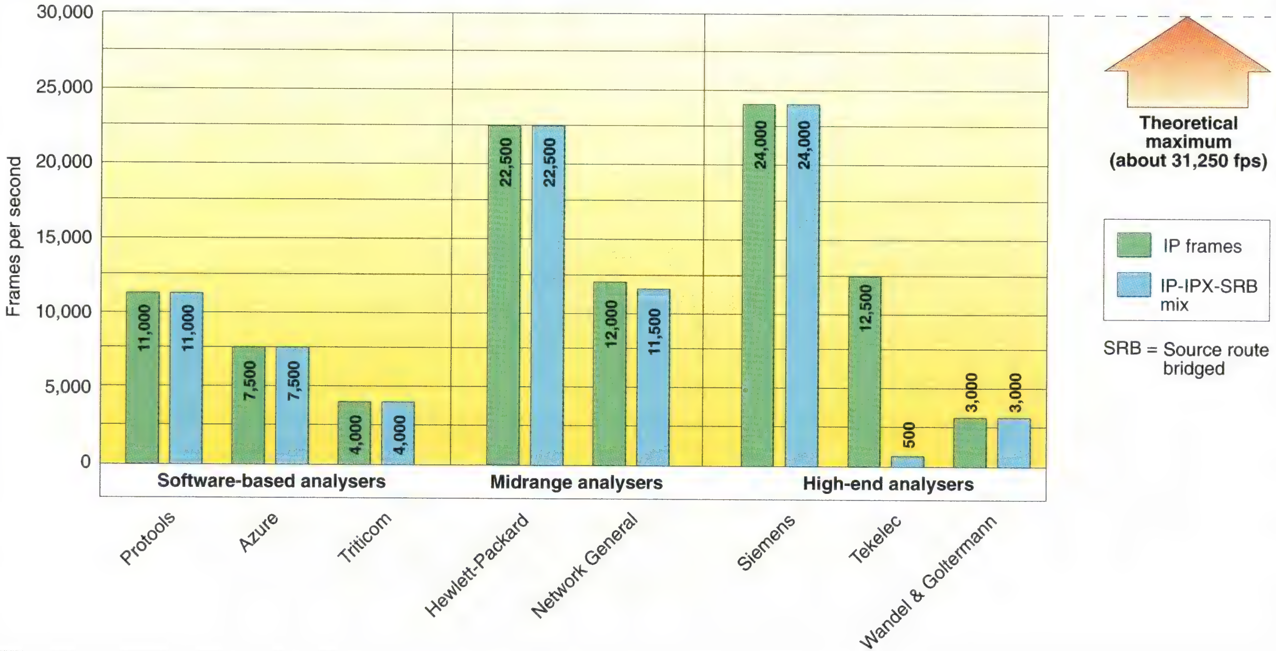
To send for a free brochure, call (02) 790 2200.

TEKELEC

Tekelec Australia Pty Limited
Suite 14, 41-45 Rickard Road, Bankstown, NSW 2000. Tel: (02) 790 2200 Fax: (02) 790 0848

Figure 3: Monitoring Token Ring Frames

64-byte single and mixed-protocol streams



nearest competitor, W&G's DA-30, generated at most 12,800fps for IP and around 7,300fps for multiprotocol traffic. Clearly, these scores will limit network managers running 'what if' scenarios to determine if their networks can handle more users or more devices.

All of the foregoing results involved 64-byte frames; differences in analyser accuracy were less pronounced when it came to large (4,096-byte) frames. Nearly all the analysers approached the theoretical maximum of 488fps in monitoring tests; the lone exception was Network General's Sniffer, which topped out at 435fps. In frame generating tests, most analysers also sent large frames at near wire speed; the two exceptions were Siemens, which generated a maximum of 290fps and Tekelec, which generated just 52fps.

Azure Technologies

Ease of use and an affordable price are the strongest suits of Azure's general-purpose LANpharaoh analyser. This product allows net managers to play back captured traffic without stopping the capture and to perform decodes in real time, both helpful features when troubleshooting.

The character-based menus make it possible to switch from Ethernet to Token Ring with a single keystroke — something offered by no other vendor. Further, LANpharaoh accommodates up to eight interfaces (for a maximum of four simultaneous capture/decode sessions), a helpful feature when testing multiport devices or modelling network traffic loads.

Azure supplied the LANpharaoh for this test in a 486-based laptop; the analyser operated at near wire speed in the Ethernet tests but trailed several other products for Token Ring. The LANpharaoh uses proprietary interface cards, which are housed in an external case when a laptop is used.

Azure's analyser decodes the full complement of LAN protocols, including TCP/IP, IPX, XNS, DECnet, DEC LAT (Local Area Transport), and Banyan Vines.

Wherever appropriate, decodes were available up to the application layer. The LANpharaoh also allows users to define their own filters and set alarm thresholds.

Protools

In the past we've been wowed by Foundation Manager's object-oriented displays and formidable feature set. This time around, despite its lacklustre performance, Foundation Manager still gave us reason to be impressed. Protools is developing drivers for IBM's new high-performance LANstreamer and Etherstreamer adaptors. Unfortunately, production versions of the drivers weren't available by press time, but we expect the IBM cards to give Foundation Manager a significant performance boost.

Foundation Manager is an OS/2-based application which allows network managers to run true multitasking sessions — a capability that comes in handy when using Foundation Manager with the vendor's RMON (remote monitoring) agent software. In our tests, we found that we could open up multiple windows without degrading frame monitoring or generating levels.

We were most impressed with Foundation Manager's interface. The software defines each function as an object; users simply drag each object onto a path to initiate multiple functions. In addition, monitoring and decoding displays were simple and straightforward, as they should be.

Sometime this year the vendor plans to port Foundation Manager to DOS/Windows 3.1, Windows NT, and two variants of Unix — IBM's AIX and Sun Microsystems' SunOS.

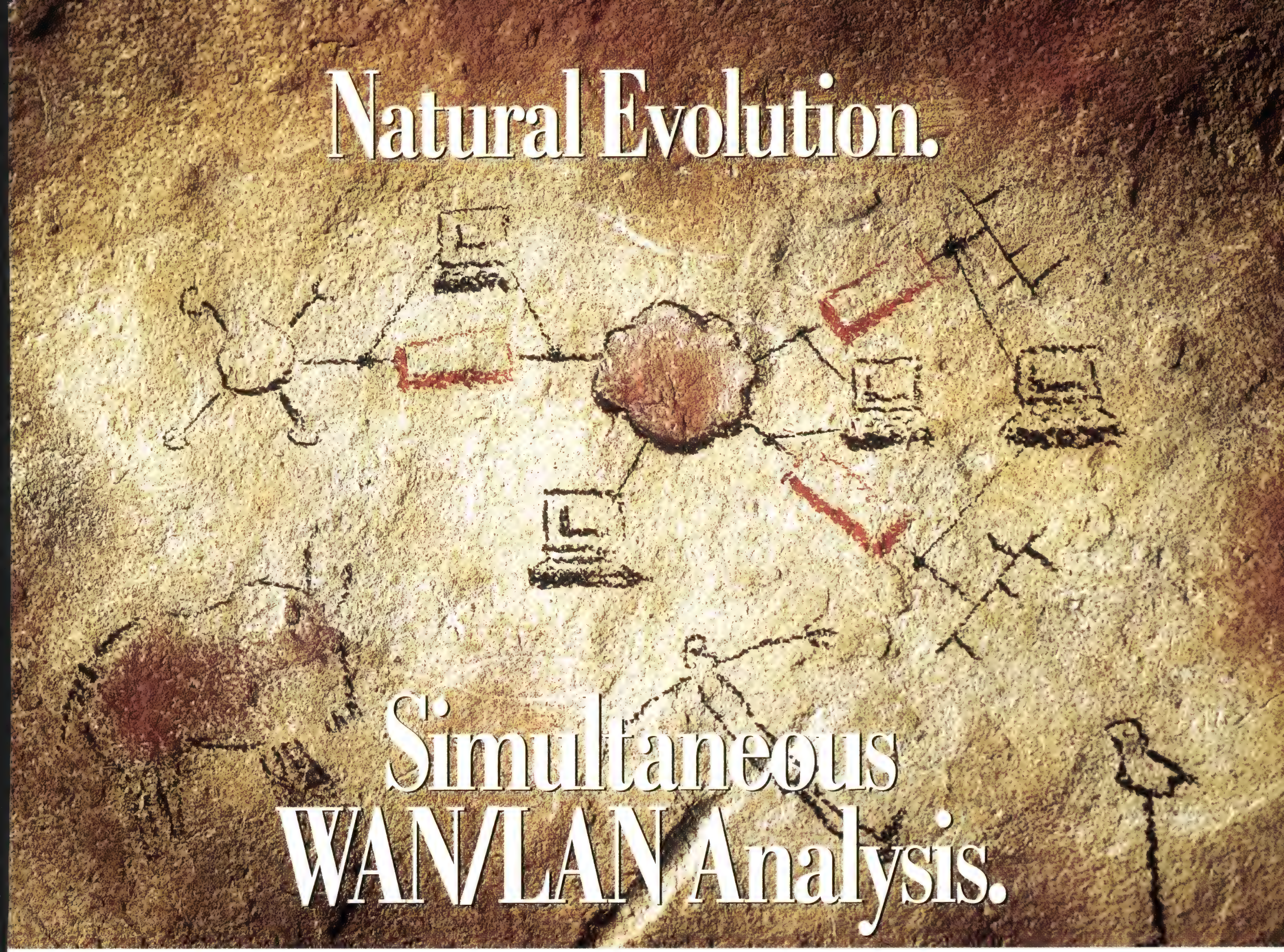
Triticom

Triticom's suite of software-only analysers are notable both for speedy operation and for bargain prices. And the software's character-based menus were among the easiest to use of any in the test.

We evaluated four Triticom software packages: the LANdecoder/e and LANdecoder/tr, analysers and frame generators for Ethernet and Token Ring, and Ethervision and Tokenvision, which are traffic monitors. The software works with virtually any PC and adaptor; Triticom supports more than 50 adaptors for Token Ring alone.

LANdecoder/e and Ethervision had no problems in our Ethernet tests, monitoring traffic at near wire speed and generating frames at slightly below the maximum rate. The software was unable to monitor protocol distribution in real time; Triticom says it is planning to ship an upgrade with this capability by press time.

In our Token Ring tests, the results were less impressive: The highest rate at which Tokenvision could accurately count 64-


Natural Evolution.
Simultaneous
WAN/LAN Analysis.

Natural Evolution in the RC family of Protocol Analyzers means WAN/LAN analysis. Utilizing plug-in interface modules, RADCOM analyzers are now available for simultaneous WAN/LAN operation with any interface card combination (WAN & WAN, WAN & LAN or LAN & LAN).

These simultaneous WAN/LAN analysis capabilities are designed to address inter-networking problems. They are available either as an integral part of RADCOM's RC-88 mid-range 256 Kbps analyzer and RC-100 high-performance 2 Mbps analyzer, or can be purchased as an upgrade package.

Main analyzer features include:

- RISC-based External Unit which plugs into any PC.
- Graphical man-machine interface based on MS-Windows.
- Weighs less than 2 kg.
- Two-channel monitoring and simulation.
- Support of Frame Relay, SMDS, X.25, SNA, Async, TCP/IP, IPX, DECnet and other protocols.
- Interface to V.35, T1, FT1, E1, FE1, RS449/530/232, X.21, Ethernet and Token Ring.
- Suitable as a tool for field service personnel, network managers and developers.

The RC Family of Portable WAN/LAN Analyzers

RAD COM
A member of the RAD group.

Radcom Equipment Inc., 900 Corporate Drive, Mahwah, NJ 07430, USA. Tel: (201) 529-1100, Fax: (201) 529-5777.
Radcom Ltd., 8 Hanechoshet St., Tel-Aviv, 69710, Israel. Tel: 972-3-6472694, Fax: 972-3-6474681.
In Australia call (02) 906-6335

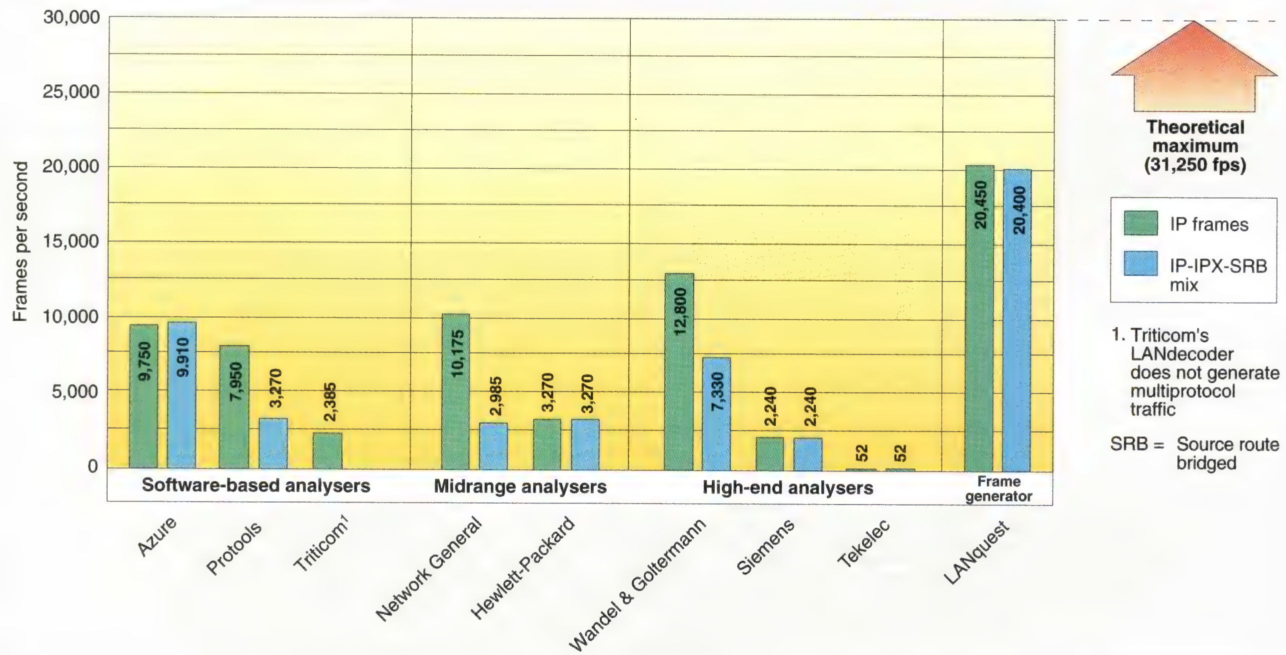


Figure 4: Generating Token Ring Frames

64-byte single and mixed-protocol streams

1. Triticom's LANdecoder does not generate multiprotocol traffic

SRB = Source route bridged

byte frames was just 4,000fps, which represents bandwidth utilisation of only 12.8%. And when generating frames, LANdecoder/tr could not send multiprotocol streams.

Hewlett-Packard

Hewlett-Packard's Network Advisor is a model of completeness. This high-end unit excels at basic tasks, uses artificial intelligence for complex jobs like performance analysis, and offers one of the industry's best graphical interfaces. What's more, the Network Advisor performed at consistently high levels in our Ethernet, FDDI, and Token Ring tests — the only analyser to do well in all three.

HP supplies the Network Advisor in a 486-based portable PC with a colour display. The vendor's proprietary interface cards are housed in external modules that plug into the PC (HP also sells analyser cards for existing PCs). The analyser monitors one segment at a time; dual connections are not possible.

The Network Advisor's graphical displays are highly customisable. For example, network managers can employ 'dashboard display' mode to track variables such as network utilisation, protocol mixtures, selected node activity, and error counts. The Network Advisor also decodes a lengthy list of LAN and WAN protocols using colour displays to separate each field in the decode. When it comes to filtering traffic, Hewlett-Packard includes an extensive set of predefined conditions (more than 30 filters for Ethernet and FDDI), each one of which can be modified.

We found the interface fairly straightforward and intuitive — with one exception. The Network Advisor doesn't have a dropped-frames indicator, an omission that could complicate load-generation testing.

On a few of the major local area network protocols, HP's analyser uses artificial intelligence software to help users track down network problems. We weren't able to evaluate that feature this time around, nor were we able to use a software upgrade that HP released during our testing. According to Hewlett-Packard, Network Advisor Version A.05 uses expert systems technology to report on TCP/IP and Novell NetWare conditions. In both cases, HP says the software reduces hundreds of frames to a few significant events.

The Hewlett-Packard Network Advisor is relatively expensive, but few analysers give network managers as much information in so many forms. For managers of complex networks who need to get to the root of troublesome and hard-to-find problems in a hurry, the extra expense may well be worth it.

Network General

Being the market leader isn't the only reason why Network General is the vendor most competitors use for comparison. The company's Expert Sniffer also has more features and functions than most others. It's justly renowned for its easy-to-use, extensive decode capabilities. And it's one of only two analysers in this test (HP's Network Advisor is the other) to use AI for solving problems.

Network General supplies its analyser in many forms: on a notebook PC, as PC software and adaptors, as 'Sniffer servers' in distributed environments, and in a portable Compaq PC. We tested this last configuration, which was a 486-based Compaq portable with a colour display and non-proprietary adaptor cards. (Note that Network General released its latest version, Sniffer 4.4, too late for inclusion in our tests.)

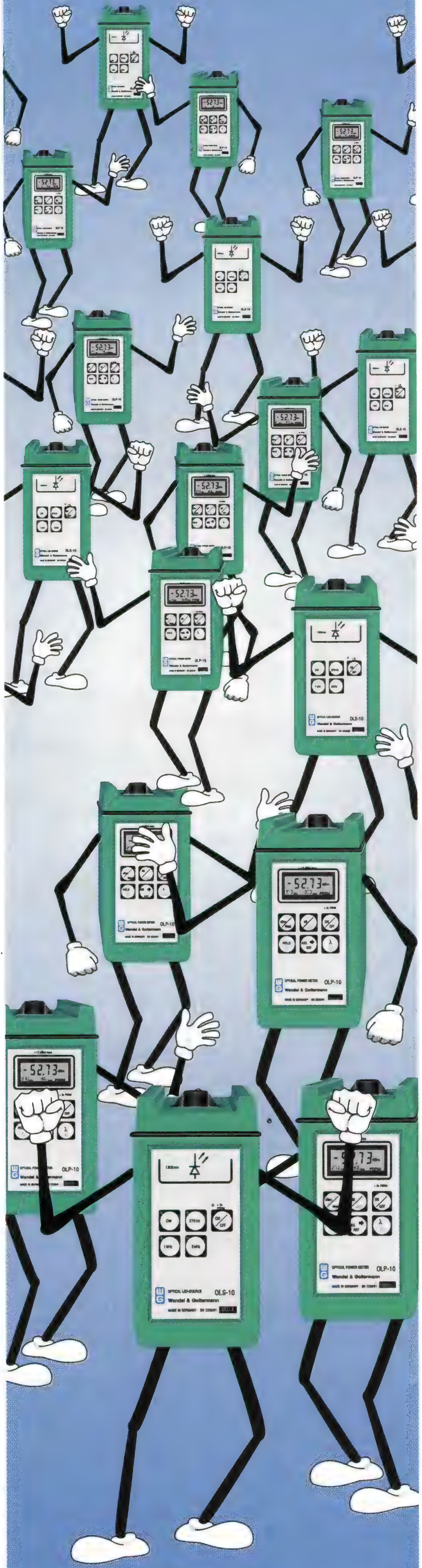
Performance proved to be spotty. While the analyser excelled in our Ethernet tests, it turned in middling scores for Token Ring, and trailed the pack for FDDI (both for monitoring and generating). Network General itself usually emphasises features over performance in its marketing material.

There's good reason for taking this tack: the Expert Sniffer's displays were among the clearest and easiest to use, especially for decodes. Character-based menus can be stepped through very quickly. Each field in a packet is colour-coded, making it easy to tell where sections begin and end. Because the Expert Sniffer can capture thousands of frames, its interface would be helped by one additional feature: a 'go to' command that would jump to a particular frame.

Network managers who don't want to wade through screen after screen of frames also can take advantage of the product's AI-based troubleshooting capabilities. In essence, the expert system tabulates network information and, based on that data, suggests probable causes of errors and remedies that can be taken.

Like HP's Network Advisor product, the Sniffer is not inexpensive, but its AI-based troubleshooting capability may be worth

E 1.94/WG1/101/4c/AUS



E 1.94/WG1/102/4c/AUS

Your little helpers for fast, precise measurements

Simply connect, power up and measure.
The new optical power meter and source from Wandel & Goltermann provide high-speed measurements in datacom and telecom environments.

- Single mode and multimode fibers
- Adapters for every connector
- Rugged enough to resist water and dirt
- Automatic fiber identification
- Complete test sets

These new, high-precision field testers have a price tag you can afford. Ask for them today.

Wandel & Goltermann Pty Ltd
PO Box 419, World Trade Center
Melbourne Vic 3005, Australia
Phone: (03) 690 6700, Fax: (03) 690 6750

PO Box 10 418, The Terrace
Wellington 6036, New Zealand
Phone: (04) 495 2290, Fax: (04) 495 2292

Wandel & Goltermann
Electronic Measurement Technology

E 1.94/WG1/103/4c/AUS

the extra cost, especially for managers of complex, high-bandwidth internetworks.

IBM

Despite IBM's very low-key take on the subject, Dataglance is one of the best-equipped FDDI analysers available. True, it can't generate traffic (it's a repeater on the FDDI ring), but on the receiving side it slices and dices more ways than almost any user would ever need. What's more the Dataglance proved extremely accurate in our performance testing.

IBM sells the Dataglance software and proprietary adaptor cards loaded into a PS/2 Model 95. Because it's an OS/2 application, the analyser handles multitasking with ease — allowing for instance, simultaneous monitor and capture. And its windowed interface can be customised to show up to 32 displays of network activity at one time.

The Dataglance offers continuous reporting on statistics like token rotation time, ring status, and null frames. It also recognises up to 48 protocols, and our performance tests showed the Dataglance capable of capturing traffic at rates approaching FDDI's 100-Mbps wire speed. Filters can easily be added on the fly. The Dataglance also offers a three-stage dropped-frames indicator, one of the clearest of those we tested. In terms of decoding, the Dataglance supports all common LAN protocols. For net managers committed to carrying multiprotocol traffic over FDDI networks, it furnishes a very strong helping hand.

IBM has announced Ethernet and Token Ring versions of the Dataglance. IBM says the new products are similar to the FDDI version in that neither offers a frame generating capability. But the new products differ in two key respects. First, they allow simultaneous monitoring of Ethernet and Token Ring. Second, they are considerably more affordable than the FDDI product.

Siemens

Siemens, a relatively recent entrant into the analyser market, made a solid showing in its initial tests. The vendor's Protocol Tester K1100 posted respectable Ethernet numbers and proved to be the highest-performing Token Ring frame monitor of any analyser we tested.

The K1100 is similar in construction to Wandel & Goltermann's DA- 30. It's a dual-port unit, allowing for simultaneous frame generation and capture. Interfaces are available for Ethernet, FDDI, and Token Ring local area networks, although Siemens did not supply an FDDI interface in time to be included in this test. Also, like the DA-30, the K1100 uses a custom processor chip on each interface board to speed processing. Siemens attributed its high Token Ring scores to this chip.

Siemens' analyser includes a very rich set of features, including real-time monitoring of protocol distributions, user-definable alarms, and extensive decoding and filtering capabilities. The analyser's character-based decodes resemble those of Network General's Sniffer, although the K1100 lacks a colour display. We found the analyser to be simple to use in our tests.

Tekelec

There is quite a lot to like about Tekelec's Chamelan 100: it offers high-level decodes, multiport analysis, and snazzy graphical displays. It provides templates for capturing and filtering data, and it allows users to define frame generation conditions with ease. But for all these features, we had two problems with the unit we tested. First, its Token Ring performance was abysmal, both for monitoring and generating traffic. Second, the product's underlying operating system is Unix, which could prove daunting to occasional users who perform software upgrades or load bug fixes.

In terms of analyser features, though, the Chamelan 100 is hard to beat. Like Azure's LANpharaoh, Siemens' K1100, and also W&G's DA-30, the product offers multiport analysis, making it possible to generate and capture traffic simultaneously — a helpful capability when it comes to stress-testing devices or networks. Up to six Ethernet or Token Ring segments can be monitored. For FDDI networks, however, the product can only monitor one network at a time.

The product uses an X-Windows interface that offers detailed but clear displays for all functions. It can track many net statistics continuously, including frame rates, token rotation times, error rates, and overall throughput. The analyser's capture/decode facilities are also quite powerful. Decoding is possible at all layers for virtually all LAN protocols. Further, long-term displays can show activity such as frame lengths and source and destination addresses, all with a high degree of accuracy.

In Token Ring tests the Chamelan 100 turned in average results for accurately monitoring pure IP traffic, but it could barely manage multiprotocol traffic at all. And the vendor's frame generating scores over Token Ring effectively rule out the unit's use for that function. Tekelec has acknowledged that its Token Ring drivers are not fully optimised, and the vendor said it has produced much better Token Ring results in-house.

Wandel & Goltermann

As the primary analyser in most Data Comm Lab Tests, W&G's DA-30 had the most to lose in this evaluation. After all, we stress the DA-30 day in and day out, and we're intimately familiar with its various quirks and limitations. What's more, the DA-30 this year faced competition from two newcomers, Siemens and Tekelec. But when our testing was through, we concluded that the DA-30 offers the best mix of features and performance of any analyser we tested. On the downside, it's also one of the most expensive analysers we looked at, and it trailed the field in our Token Ring monitoring tests.

The DA-30 has some PC components, such as an Intel 80486 CPU, but it's really a proprietary product. Multiple interface cards sport their own processors, eliminating the bus as a bottleneck. And the DA-30 uses a proprietary operating system and programming language that makes it possible for users to modify applications. (The DA-30 employs DOS for its user interface, however.)

Like analysers from Azure and Tekelec, the DA-30 is a multiport device: it can simultaneously generate and capture traffic. Among the topologies supported are Ethernet, Token Ring, FDDI, and a host of WAN options, making the DA-30 a solid choice for internetworks where simultaneous LAN and WAN analysis is needed.

Decodes are available at all layers for virtually all networking protocols, and the DA-30 offers a wealth of information about every byte of every frame. However, the DA-30 only presents one layer per screen, which could slow down troubleshooting efforts considerably.

The DA-30's character-based menu interface is serviceable but not spectacular. For example, the analyser's frame editor allows users to craft up to 100 different frames for transmission but does not support cut-and-paste functions that would simplify the task. (As noted, LANquest Labs' Framethrower allows frames to be created with an ASCII text editor and then loaded onto a DA-30.)

The DA-30 breezed through our Ethernet and FDDI performance tests, proving capable of generating and monitoring traffic on both topologies at nearly wire speed. In our Token Ring monitoring tests, however, the DA-30 underperformed the field. The highest rate at which the DA-30 kept an accurate count of 64-byte frames was just 3,000fps, which represents bandwidth utilisation of less than 10%. Results were consistently off by about 2.3%, even at rates as high as 23,000fps. W&G has acknowledged the limitations of its Token Ring software, and says it's working to correct the problem.

Alantec

First things first: Alantec's Powerbits is a frame generator, not a LAN analyser. It can't do decodes or provide LAN managers with troubleshooting tips. But for finding the top speed of a device or testing traffic

The affordable HP WAN/LAN tester: Because you know how network problems can look if you aren't equipped to handle them.

© 1993 Hewlett-Packard Co.

At last, the performance and price you need to put problems back in perspective.

Without the right equipment, there's no such thing as a small network problem. Because even the tiniest bug can become a large and painful nuisance if you don't catch it in time.

At HP, we know what you're facing. And what you can afford to do about it. So we gave our new HP J2300A series WAN/LAN protocol analysers the uncompromised advanced capabilities you need to troubleshoot your network.

No problem is too big for the HP J2300A series. Whether you're monitoring frame relay, X.25 or BOPs, it offers the high-speed performance you need. You can even examine LAN traffic encapsulated on WANs and do extensive BERT testing — all at speeds up to 2 Mbps.

What's more, expert systems and intelligent analysis let you quickly isolate problems on both Token Ring and Ethernet networks. And you get complete decodes for Novell, TCP/IP, DECnet, AppleTalk and others.

Add a rugged, full-function 486 DOS PC under one handle — plus expansion capability to solve future problems such as ATM — and you'll find network challenges suddenly look far less intimidating.

If you'd like information or a product demonstration on how the new analysers allow you to catch network problems more affordably than ever, call our Customer Information Centre on **13 1347** and ask for extension **2902.**

We'll help you minimise network problems. And what it costs to control them.

A better way.

HEWLETT® PACKARD

Test Methodology

To evaluate the accuracy of frame counting, we put together three test networks — a 10Base-T Ethernet, a 100Mbps FDDI network (with multimode fibre), and a 16Mbps Token Ring (with shielded twisted-pair cabling). A different hub was used for each: a Linkbuilder FMS concentrator from 3Com connected the Ethernet devices; a Fibrehub 1600 concentrator from Interphase linked the FDDI devices; and an IBM 8228 MAU (multistation access unit) linked the Token Ring devices.

In the frame counting test, our goal was to evaluate each analyser's ability to count traffic at a variety of data rates, frame sizes, and protocol mixes. We accomplished this by generating a known quantity of frames for at least five seconds and comparing this quantity with the count given by the analyser under test. The frame rate was increased until the analyser gave an erroneous count or until bandwidth utilisation neared saturation. The margin for error for all results in this test was 2%.

In the Ethernet tests, 64 and 1,518-byte frames were used, while in the Token Ring and FDDI tests, 64 and 4,096-byte frames were used.

To test the effects of different protocols and protocol mixtures on throughput, IP, IPX, and bridged traffic were used, both alone and in various combinations.

The frame generators used in the Ethernet, FDDI, and Token Ring tests, respectively, were Alantec's Powerbits, W&G's DA-30, and FMPTEST software from Madge Networks. The maximum offered loads in all of the Ethernet, FDDI, and Token Ring tests were set at 14,794 frames per second (fps), 166,650fps, and 24,000fps, respectively.

To measure frame generation levels, each analyser was set to send traffic at its highest possible rate. The frame generation tests involved the same frame sizes, protocols, and protocol distributions as those used in the frame counting tests.

The network analyser products used to count frames were Triticom's Ethervision for the Ethernet tests; IBM's Dataglance for the FDDI tests; and Madge's FMPTEST for the Token Ring tests. If any discrepancy was found between the counting analyser and the frames sent by the analyser placed under test, results were checked with two additional analysers: HP's Network Advisor and W&G's DA-30.

loads on a network (basic tasks for product engineers and network designers) few products are any better equipped than Alantec's Powerbits.

Developed specifically as a testing tool, Powerbits handles Ethernet's full 10Mbps on each of its 12 ports. Because the device can count frames as well as generate them, it can accommodate up to six simultaneous transmit/capture sessions — a feature that simplifies testing of multiport devices like bridges and routers. In our tests, we found Powerbits capable of generating and counting traffic at rates close to Ethernet's wire speed.

Powerbits presents three kinds of measurements: throughput, frame loss rate, and frame-forwarding rate. In addition, the product uses a scripting language that allows net managers to define protocols, traffic patterns of up to 320 frames, and duration of test streams. The scripting language also supports the use of conditional and environmental variables, allowing net managers to write complex testing routines. Scripts can be created via a command-line interface, or written with an ASCII text editor and then loaded onto the product.

All of these features come at a price, though. Powerbits is expensive and its command-line interface and scripting language can be daunting, even for frequent users. And Powerbits remains an Ethernet-only device, at least for now. Alantec plans to add FDDI support and a graphical interface early this year.

LANquest

LANquest's Framethrower is just what its name suggests — a frame generator. It does not perform decoding, filtering, or monitoring. What it does do is generate frames easily, at reasonably high rates, and at relatively low cost. LANquest positions the product as a complement to full-fledged analysers.

The Framethrower consists of software and a specific adaptor card; the software is bound to that adaptor's MAC (media access control) address. Ethernet, FDDI, Token Ring versions are available, all of which use conventional adaptors from 3Com or Madge Networks. For this test, LANquest supplied a Compaq Deskpro 486/66M with 16Mbyte of RAM.

The Framethrower posted respectable but not stellar results in our tests. It proved capable of generating nearly 14,000pps in the Ethernet tests — a level lower than those of few other vendors, though only by an insignificant margin. In the FDDI tests, Framethrower generated a rather disappointing 96,000fps — a figure that represents only about 49% FDDI utilisation. But Framethrower proved the fastest product of all in our Token Ring tests, generating 64-byte frames at better than 20,000fps. The device's nearest competitor, Wandel & Goltermann's high-end DA-30, could generate just 12,800fps. In addition, Framethrower generated multiprotocol traffic just as well as single-protocol streams.

The product's character-based interface was not particularly straightforward. For example, it offers users a long list of sample protocols, but doesn't say how to select one or more. The software does have one commendable feature, though: a built-in text editor that simplifies the creation of custom traffic patterns. The text editor can even be used to write test patterns for four other vendors' analysers — HP's Network Advisor, Network General's Sniffer, Network Communications Corporation's LANalyzer, and W&G's DA-30.

Kevin Tolly is Director of the Data Comm Test Lab and President of Interlab. He is based in Sea Girt, New Jersey. David Newman is Testing Editor for Data Communications magazine, based in Boston.

BANDWIDTH ON DEMAND

Networking by Dataplex

For networking solutions that work, call us on
(03) 210 3333 (02) 349 3911 (06) 285 3657

Local, Wide Area and Switched Networks

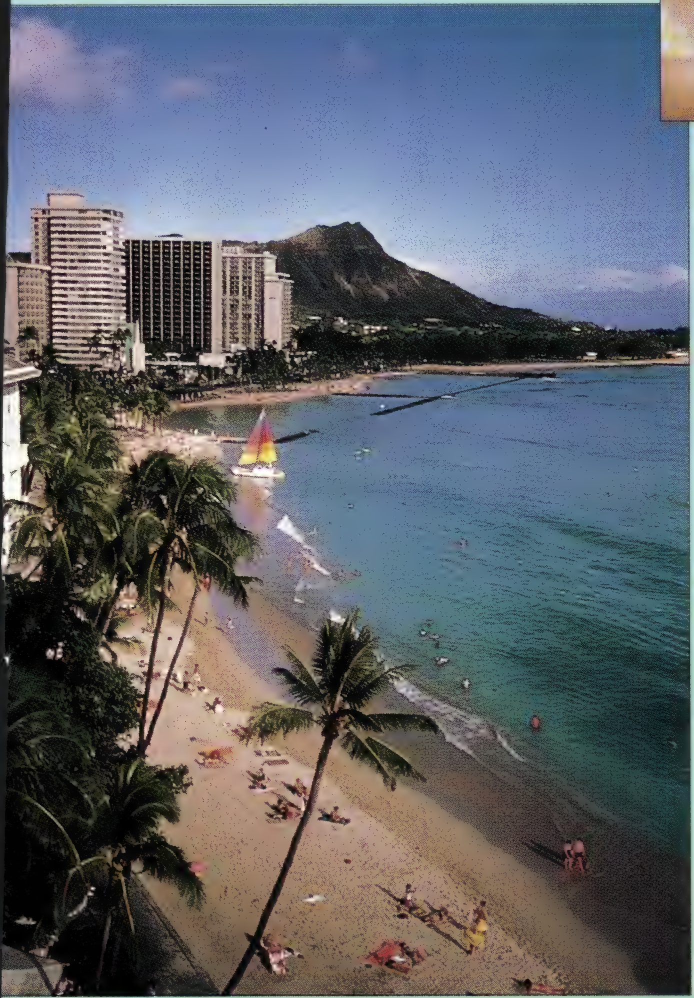
Dataplex

DPX 185 B

Subscribe to *Australian Communications*

and take **MCI**'s Superhighway to the USA

By subscribing to *Australian Communications* you could **WIN** a business class trip for two to Hawaii staying at the Sheraton Waikiki compliments of MCI, the leading provider of high quality global communications services.



Trip includes:

- Return business class flights for two on Qantas to Hawaii from your home capital city
- 5 nights twin share at Sheraton Waikiki Hotel
- US airport transfers and departure tax
- MCI *Calling Card* valued at $100

INTERVIEW: IBM CHIEF BRIAN FINN

AUSTRALIAN communications

FEBRUARY 1994

HIGH-SPEED LANS

Which technology will win the race for market share?

NETWORKING STAKES

2-1 ATM
EVENS 100VG-ANYLAN
10-1 FAST ETHERNET
500-1 HIGH SPEED TOKEN RING
10-1 FIBRE CHANNEL
100-1 FDDI
100-1 FDDI OVER COPPER
500-1 FDDI II
100-1 ISOCHRONOUS ETHERNET
500-1 FFOL

BUYING A WAN
Part #2 of our eight vendor play-off

ATM CPE
First generation products hit the streets

THE TN3270 PROTOCOL
Running SNA over a TCP/IP backbone without the fuss

THE FACTS ON FAX
Does plug-and-play really mean plug-and-pay?

QANTAS JETABOUT HOLIDAYS

MCI

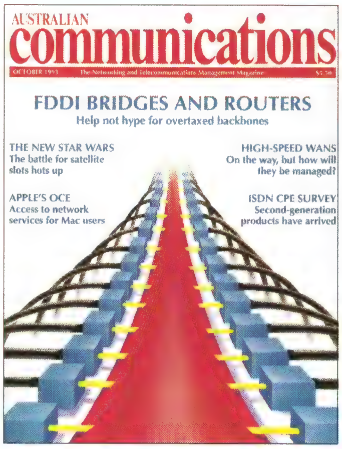
See over for details

THE NETWORKING AND TELECOMMUNICATIONS MANAGEMENT MAGAZINE

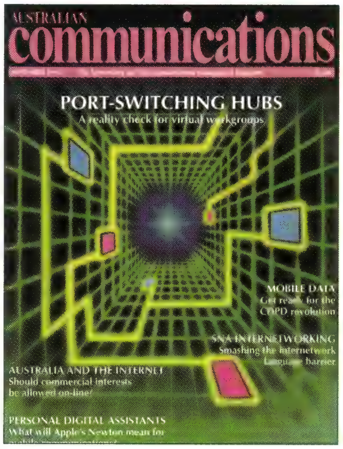
Why not get the WHOLE story on communications?

Whether it's GSM, SDH, FDDI, OSI, ATM, ISDN, SNA, Frame Relay, Fastpac, Token Ring or Ethernet, you need to be on top of the rapid changes now taking place in the communications industry.

Each month in the pages of Australian Communications the region's top communications journalists, industry figures, academics, professionals and experts bring you the latest news and analysis on the technical, political and management issues facing this dynamic industry.


AUSTRALIAN
communications
OCTOBER 1993
The Networking and Telecommunications Management Magazine
$5.50
FDDI BRIDGES AND ROUTERS
Help not hype for overtaxed backbones
THE NEW STAR WARS
The battle for satellite slots hots up
HIGH-SPEED WANS
On the way, but how will they be managed?
APPLE'S OCE
Access to network services for Mac users
ISDN CPE SURVEY
Second-generation products have arrived

INTERVIEW: OPTUS CEO BOB MANSFIELD
AUSTRALIAN
communications
The Networking and Telecommunications Management Magazine
$5.50
A CHRISTMAS WAN
NETWARE 4.0
The work behind the network
WORKGROUP NETWORKING
The implications for protocol


AUSTRALIAN
communications
PORT-SWITCHING HUBS
A reality check for virtual workgroups
MOBILE DATA
Get ready for the CDPD revolution
SNA INTERNETWORKING
Smashing the internetwork language barrier
AUSTRALIA AND THE INTERNET
Should commercial interests be allowed on-line?
PERSONAL DIGITAL ASSISTANTS
What will Apple's Newton mean for

AUSTRALIAN
communications
JULY 1993
The Networking and Telecommunications Management Magazine
$5.50
THE SNA MIGRATION DILEMMA
How to position the network for LAN interconnect?
RATING ROUTERS
Can routers be trusted with critical data?
LAN MANAGEMENT
Will new proactive tools keep LANs trouble-free?
INTEL'S PENTIUM
What does the new processor mean for net managers?
CDMA
Is it the future for mobile communications?
APPN
TCP/IP
APPI

RULES AND CONDITIONS OF ENTRY

1. Instructions on how to enter form part of these Rules and Conditions of Entry. Entry is free and open to all residents of Australia (valid only in States where legal) other than employees of the promoters: Ostasun Pty Ltd ACN 003 606 102, 4/541 Kent Street Sydney NSW 2000; MCI International ARBN 055 216 594; their families and associated agencies.
2. To enter use the coupon provided. Only one entry per subscription is permitted. Each correct entry will go into the prize draw and the winning entry will be the first drawn on 1st June, 1994, by a representative of MCI International at 302/3 Pymble Corporate Centre, 20 Bridge Street, Pymble, NSW. Entries not completed in accordance with the rules and conditions, or received after the closing date of 31st May 1993, will not be considered.
3. The judge's decision is final and no correspondence will be entered into. The prize is not transferable nor redeemable for cash. All entries remain the property of *Australian Communications* magazine. The prize winner will be notified by telephone and their name published in the July 1994 issue of *Australian Communications*.
4. The winner will receive a Qantas Jetabout trip for two consisting of return Business Class airfare to Honolulu (from the winner's home state capital) with five nights twin share accommodation at the Sheraton Waikiki and airport transfers in Hawaii. MCI will provide a phone credit card for calling Australia with $100 value. The prize is valid to March 1995 accommodation and flights are subject to availability. The prize does not include meals or spending money. Prize Value $7,100.

SUBSCRIBE NOW

☐ 2 years (22 issues) for $84 (save 30%) ☐ 1 year (11 issues) for $42 (save 30%)

Name ....

Title ....

Company ....

Address ....

.... Postcode ....

Telephone ....

I enclose a cheque for $ .... ☐ Bill my company

Authorising signature ....

Charge my: ☐ Amex ☐ Bankcard ☐ Diners ☐ Visa ☐ Mastercard

Account No .... Expiry date ....

Signature ....

NSW Permit No. TC 94/1127. Vic Permit No. 94/774 issued on 15/3/1994.
ACT Permit No. TP 94/0502. Northern Territory Permit No. NT94/0394

MCI

POST TO: Australian Communications, 4th Floor, 541 Kent Street, Sydney NSW 2000
FAX TO: (02) 264 2244

Banyan ENS for HP-UX

Banyan has announced that its high-level enterprise networking software, Enterprise Network Services (ENS), is now available for Hewlett-Packard's HP 9000 Series 800 PA-RISC-based business servers.

The company said HP 9000 users will now be able to access Banyan's integrated enterprise network services such as messaging, directories, security and network management, and will be able to easily combine PC and Unix environments.

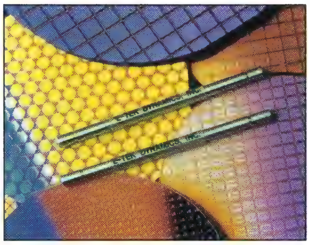
Banyan's ENS for HP-UX includes DOS, OS/2, Windows and Unix client support, and joint development work by Banyan and Oracle means Oracle 7 has also been integrated with ENS for HP-UX.

Banyan officials claim the benefits of ENS for HP-UX include ease of administration of large networks through integration of services across diverse platforms, and the ability to access services such as databases, applications and other network resources — regardless of their physical location on the LAN.

Pricing for ENS for HP-UX is user-based, and ranges from $US5,495 for a 20-user pack to $US54,995 for a 1,000-user pack.
Banyan (02) 954 3228

Fibre Optic Couplers

Kingfisher International has announced the release of E-Tek's complete range of couplers for singlemode and multimode applications, which officials said offer the lowest possible Polarisation Dependence Loss available. The products' other features include a low insertion loss over the wavelength range, high return loss and directivity, temperature and humidity stability and shock resistance. Its splitting ratios range from 50/50 to 0.1/99.9, said officials, adding that the product is suited to a range of applications including telecommunications, long haul, subscriber loop and LANs.
Kingfisher International (03) 764 3933


E-Tek's couplers can be used in a wide range of applications

Cordless LANs

Com Tech has introduced Xircom's new family of cordless local area network adaptors, known as Netwave. The products all operate at a frequency of 2.4GHz and use spread spectrum radio technology, and all make use of Xircom's own Netwave MAC protocol.

The new product line includes: the Xircom CreditCard Netwave Adaptor, which is a PCMCIA 2.0-compliant Type II card with an integrated design which eliminates the AC power cord and the need for external circuitry and antenna; the Pocket Netwave Adaptor, which attaches to computing devices via the parallel port and offers Enhanced Parallel Port (EPP) high-speed data transfers and a phantom power cable, eliminating the need for an external AC cord; and the Netwave Access Point for Ethernet, which provides a cordless link between a Netwave LAN and a wired IEEE 802.3 Ethernet LAN.

The new product features roaming, automatic load balancing for increased capacity, power management, high security and data encryption. Each unit has a range of 50 metres, and Xircom said one Access Point can support up to ten users. Access Point units come with connectors for 10Base-T, 10Base-2 and 10Base-5, and a Token Ring version is planned for later this year, according to officials.

The Netwave Adaptor and the Pocket Netwave Adaptor are priced at $1,015, while the Netwave Access Point for Ethernet sells for $3,050.
Com Tech (02) 317 3088

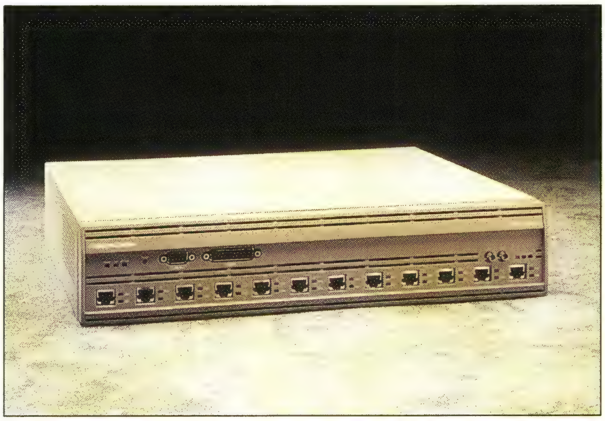
Fibre Optic Modem

Kingfisher International has recently released a new low cost 800Mbps fibre optic HIPPI modem from US vendor Broadband Communications, which company officials claim is the fastest modem of its type on the market today.

Officials said the product is fully compliant with the latest ad hoc High Performance Parallel Interface (HIPPI) open standard and the ANSI HIPPI standard.

The Model 1240 is interoperable with BCP's 1210 Fibre Optic HIPPI Extender, and provides a 1.2 gigabaud bi-directional transmission link with an 800Mbps throughput rate.

The unit features a small footprint, with dimensions of 4.49 by 34.6 by 37.4 centimetres, and has a range of one kilometre using multimode fibre, or as much as 10km using singlemode fibre.
Kingfisher (03) 764 3933


The EtherCell allows users to build mixed Ethernet and ATM LANs

SynOptics' Ethernet-to-ATM Connectivity

SynOptics has released the EtherCell, a new standalone switch that translates data between 10Mbps Ethernet frames and 155Mbps ATM cells. The product is designed to act as the front-end to a SynOptics LattisCell ATM switch, and will enable users to build high performance mixed ATM and Ethernet networks, according to officials.

The EtherCell's single 155Mbps Sonet/SDH ATM port is able to receive data simultaneously from all 12 10Base-T Ethernet ports at wire speed, allowing several Ethernet clients to access an ATM server at the same time. SynOptics' Ethernet-to-ATM translation technology is called CelliFrame, and is consistent with evolving ATM Forum LAN emulation specs.

The company has also announced a new version of its Connection Management System (CMS 1.1) and its Network Management Application (version 1.1), which both now support the EtherCell and LattisCell switching environments. The Network Management Application works with SynOptics' Optivity software to manage mixed networks of ATM, Ethernet, Token Ring and FDDI, and provides powerful drag and drop capabilities that enable users to define virtual networks.

The EtherCell also supports multicast and broadcast traffic over the ATM Adaptation Layer AAL 5 standard via Multicast Server software, which comes bundled with CMS 1.1. Two versions of the product are available — the Model 10328-F comes with 12 10Base-T Ethernet ports and one ATM port and a multi-mode fibre Sonet/SDH interface, and costs $18,500; while the Model 10328-C has 12 10Base-T ports, one ATM port, with a Category 5 UTP/Sonet/SDH interface, and costs $17,500.

Connection Management System version 1.1 supports both switched and permanent virtual channels and includes the Multicast Server, and sells for $6,495. The Network Management Application version 1.1 costs $8,345.
SynOptics (03) 853 0799

Datacraft Bolsters X.400 Offerings

Melbourne-based networking vendor Datacraft has announced the release of a range of products which make use of X.400 messaging. The new Isoplex 800 product for users of DOS-based PCs connected via a LAN enables the transmission and receipt of electronic documents worldwide via any combination of public and/or private messaging networks. The product has been developed by US vendor Isocor, and is a full implementation of the 1988 CCITT X.400 recommendations, offering an extensive features set which was not previously available to DOS users, said company officials. The Isoplex 800 offers full error recovery, remote administration, EDI, TCP/IP and OSI protocol support and automatic downgrading to X.400 mode to enable synchronisation with early generation X.400 servers and public e-mail systems.

The system conforms to GOSIP mandates, and communications are provided over multi-protocol networks using TCP/IP or OSI over Ethernet, Token Ring, frame relay, X.25, IBM APPC, high-speed asynchronous dial-up or ISDN. There are optional software modules offering links to well-known e-mail packages such as cc:Mail, Microsoft Mail, Novell NetWare MHS, WordPerfect Office and others, and EDI support using the X.435 EDI/X.400 standard.

Isocor has also released the new X.400 Router for Lotus Notes which enables users to access and exchange text, binary files and multimedia information across a wide range of LAN e-mail packages and public messaging networks. Company officials said the Router, coupled with Isoplex 800, forms a complete electronic messaging system that gives Lotus Notes users the ability to transfer files of any size or type over public and private networks. Users are able to access X.400 e-mail and file exchange services with systems like IBM mainframes running PROFS, DEC minicomputers running All-in-1, AT&T Easylink, MCI Mail, SprintMail, Microsoft Mail, WordPerfect Office, NetWare MHS, SMTP/UnixMail, fax, telex, paging and other networks, according to Datacraft officials.

The X.400 Router adds a new 'tunnelling' feature to Notes, which allows the product to link servers across complex internetworks by encapsulating information in an X.400 envelope and transmitting it across multiple X.400 message switching to another Notes server which has X.400 Router installed. The tunnelling feature supports compound document transfer, digitised voice, images, and G3 facsimile.

Datacraft (03) 727 9111

Radio Test Set

Wedgetail Technologies has announced the release of Schlumberger's Model 4015 radio test set, a compact and lightweight test set designed especially for field use.

The company said the 4015 includes a range of features usually only found in larger, higher-priced models. The unit covers from 400KHz to 1GHz, and can handle power levels of up to 150Watts. The standard model comes with a $2\mu v$ receiver and a full feature spectrum analyser, which includes a tracking generator for accurate testing of filters and diplexers. A cable fault locator feature is also available to enable field engineers to quickly identify faults in both coaxial systems and antenna feeders, officials said.

The device incorporates a digital storage scope with marker facility, and results are displayed on an electroluminescent display, allowing easy viewing in any kind of lighting situation.

Officials said a key feature of the 4015 is the use of electronic representations of needle meters for all of the major test parameters. Users also have the option to zoom in on any meter and expand it to fill most of the screen.

The system utilises pop-up windows, and includes an inbuilt computer which permits fully automatic test routines to be run. Users can also write their own programs using a PC and store them with test results on the 4015 or on memory cards.

The modular design means faulty modules can be replaced easily without affecting calibration. Remote control via RS232 is available, and the unit also offers a range of specialised options like AMPS cellular, MPT-1327 trunk radio, US/EF Johnston trunking and POCSAG paging. DTMF encode and decode is also available, and the unit offers the EDACS trunk radio system as an option.

Wedgetail Technologies
(02) 415 3944

Extra! for Windows

Melbourne-based Distributed Data Processing (DDP) has introduced the new version of Attachmate's IBM 3270 terminal emulation software, Attachmate Extra! for Windows version 4.0.

Company officials said that Extra! for Windows 4.0 users can open and work with host applications as if they were local Windows applications, and each application can have its own different interface. Officials said this is a significant benefit, because in the past users of terminal emulation packages had to make do with the same menus and and the same functionality, regardless of what kind of application was being used.

The new software comes with pre-defined schemes for many commonly used host applications like Office Vision (PROFS), CICS, MEMO, QMF and EMC2. There are a number of ease-of-use additions such as a new toolbar, drag-and-drop file transfer capability, and a floating toolbar called SmartPad.

The package also incorporates Extra! Basic scripting language, which provides programmers with a drag-and-drop environment in order to develop other graphical applications and automate tasks. There are also many built-in security features, and, in addition, Extra! has added the WinHLLAPI function set to develop re-engineered client/host applications.

The software supports LAN, WAN, direct or remote SNA environments, and now also Microsoft SNA server, Banyan IP and TCP/IP to the Attachmate Gateway, and NetView RTM.

Attachmate Extra! for Windows 4.0 is priced at $765.

DDP (03) 694 6711

Brouter Adaptors

Force Technology has announced the introduction of three new Olicom Brouter Adaptors featuring Olicom's PowerMac drivers. The adaptors are high performance ISA, EISA and MCA Token Ring network interface cards which have been specially designed to work in NetWare MultiProtocol Router version 2.0 and 2.1 environments.

Company officials said that using the new adaptors with

The Model 4015 is well-suited to field use, being light and compact high performance PCs and NetWare and NetWare MultiProtocol Router software would enable network users to build low-cost, high performance Token Ring bridges and routers.

The Brouter Adaptors provide a raw frame processing capability of over 30,000 frames per second, according to company officials. They said that, used in conjunction with NetWare MultiProtocol Router software and PCs, users could build global internetworks utilising standard protocols such as IPX, IP, AppleTalk, Novell NetBIOS and OSI, and added that the solution is a powerful and cost-effective alternative to traditional dedicated routers.

Force Technology
(02) 971 1000

UB Hub Management

Ungermann-Bass has announced the release of NetAssistant, a new Windows-based entry-level network management application for managing Ungermann-Bass hubs in small to mid-sized LANs. While the software is able to manage all UB hubs, it has been specially designed to work with UB's range of stackable hubs, and provides automated management features and on-demand expertise to assist at sites where there is not a full-time network professional.

NetAssistant software can be used with UB's Access/Stax stackable Ethernet hub, or can manage Ethernet and Token Ring concentrators within UB's enterprise hub. It automates four of the basic network management functions: discovery and mapping of network devices; device configuration; logging of network events; and the solution of network problems.

The software features one-step installation, and monitors IP addresses, automatically assigning a next available address when an Access/Stax unit is installed, simplifying the task of installing new IP devices, company officials said. Each device is assigned an icon specific to its type, and icons are colour-coded to immediately indicate a device's status.

The NetAdvice feature of NetAssistant provides both an introduction to networking and a full interpretation of most network events. On demand expertise helps non-technical people to resolve common networking problems — for example, SNMP traps are explained in plain English, along with the steps needed to rectify the problem.

The FocusView feature allows administrators to quickly view information on hub configuration, performance and faults. NetAssistant will be priced at $1,445.

Ungermann-Bass
(03) 696 2006

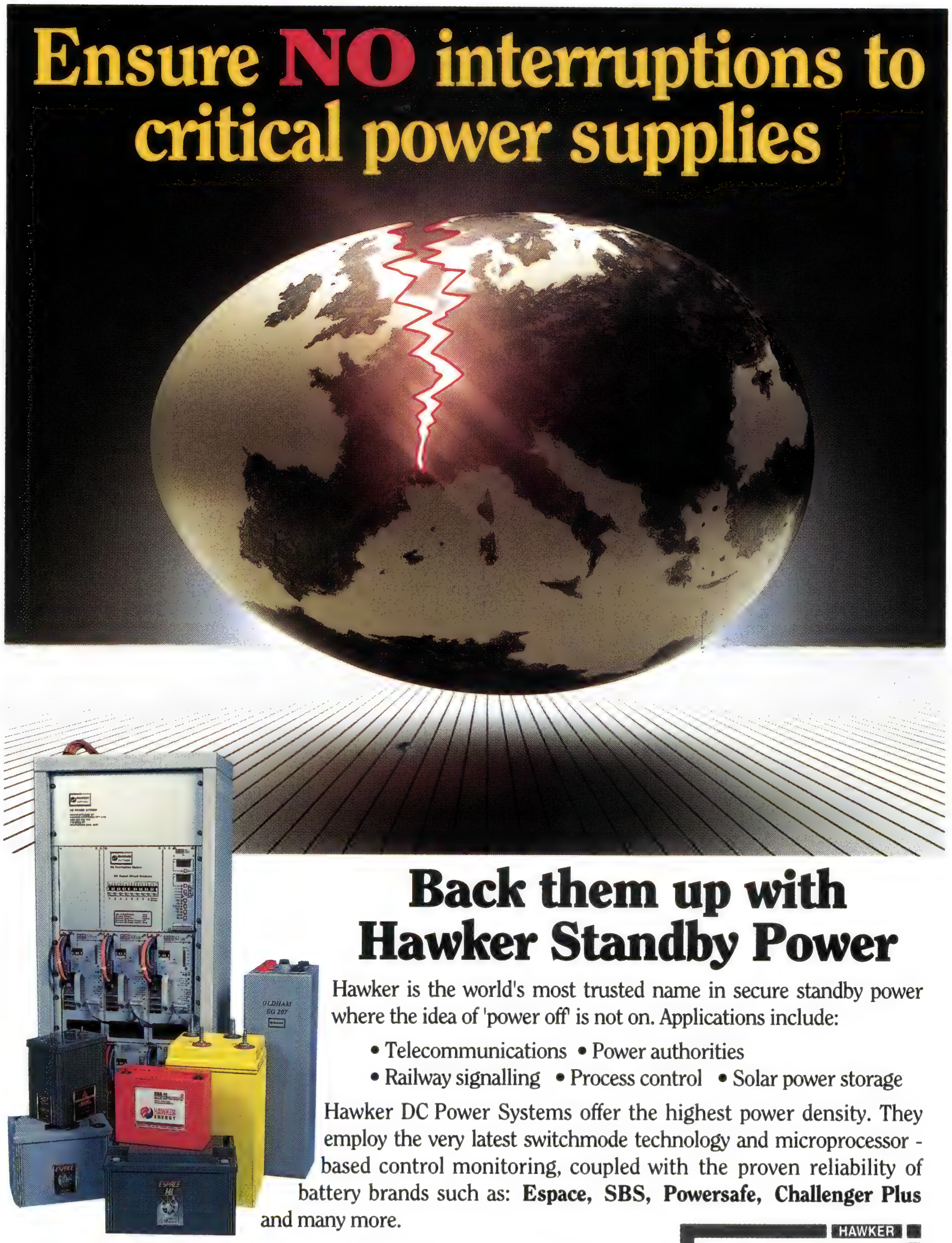
PCMCIA Adaptors for EtherLink Family

3Com has added a new release model to its EtherLink III family of parallel tasking adaptors — the EtherLink III PCMCIA adaptor — especially designed for notebook computers.

Officials from the company said the adaptor is up to 110% faster than rival products due to 3Com-developed ASICs and parallel tasking technology.

The EtherLink PCMCIA adaptor is specially designed for laptops

They said the adaptor is easy to install using 3Com's AutoLink software. Users need only answer 'yes' to one prompt, and the card, PC and network server work to run diagnostics, configure the card and download the NetWare client software from



Ensure NO interruptions to critical power supplies

Back them up with Hawker Standby Power

Hawker is the world's most trusted name in secure standby power where the idea of 'power off' is not on. Applications include:

- Telecommunications
- Power authorities
- Railway signalling
- Process control
- Solar power storage

Hawker DC Power Systems offer the highest power density. They employ the very latest switchmode technology and microprocessor - based control monitoring, coupled with the proven reliability of battery brands such as: **Espace, SBS, Powersafe, Challenger Plus** and many more.

For details of the superior response, reliability and cost-efficiency of low-maintenance Hawker Power Systems, please phone or fax for comprehensive technical information.

SYDNEY: 119-127 Wicks Rd North Ryde NSW 2113 Tel: (02) 878 5000 Fax: (02) 878 5555
MELBOURNE: 832 High St East Kew VIC 3102 Tel: (03) 810 9568 Fax: (03) 810 9589
QUEENSLAND: 240 Ipswich Rd Buranda QLD 4102 Tel: (07) 391 0444 Fax: (07) 391 0400

HAWKER
HAWKER BATTERIES
POWER BY DESIGN

the server. If the AutoLink software does not detect a network fileserver, a standard client is downloaded from the 3Com supplied EtherDisk. The card can also be used with 3Com's own Transcend SmartAgent network management software and SNMP network management software.

The EtherLink III PCMCIA adaptor is available in both TP (twisted pair) and Combo (twisted pair and thin coax) versions, company officials said.

Pricing per adaptor is $335 for TP, and $400 for Combo adaptors. Both versions are sold in packs of five.

3Com (02) 959 3020

Stallion's multiport cards have won coveted Novell certification

Novell Certifies Stallion Products

Australian connectivity product manufacturer, Stallion Technologies, has announced that products from its range of ONboard and Brumby multiport serial cards have received Novell certification to operate in NetWare environments.

Officials from the company said that Stallion is one of the world's first vendors to achieve certified compatibility with NetWare versions 3.11, 3.12 and 4.01, and Novell's new NetWare Connect 1.0.

The products to receive certification are the Brumby 4-port board and the Brumby 4-port and 8-port multiport cards. The Brumby card is compatible with all ISA bus machines, while the ONboard products are available for ISA, EISA and MicroChannel systems.

If used in conjunction with Novell's Network Access Server (NAS), the ONBoard allows up to 16 users to remotely connect to Novell LANs (using two ONBoards), giving them access to the same LAN service as if they were attached locally. Additionally, NetWare Connect lets DOS and Mac users access LAN services without requiring remote control programs like NAS.

The ONBoard or Brumby also allow up to 32 modems to be connected to a NetWare Asynchronous Communications Services or NetWare Connect server, which allows NetWare networks to have multiple transparent, reliable, high-performance connections to other LANs or to standalone systems.

Stallion Technologies
(07) 870 4999

New DA-30 Application

Wandel & Goltermann has announced a new application for its DA-30 Internetwork Analyser that makes use of time signals from Global Positioning System satellites to make highly ac-

Imagine a
2Mps WAN Analyser
the size of a
Notebook.

Protocols:
X.25
SNA
SMDS
Encapsulation Analisis
Frame Relay

Interfaces:
RS-232
X.21
V.35
RS-449
RS-530
T1\E1
Fractional E1

The RC-100

Versatile
External, RISC-based WAN Analyser which plugs into any PC (including Notebook) via the parallel port.

Powerful
Protocol analysis, including Frame Relay Analysis and Emulation, at up to 2Mbps and 40,000 frames per second (fps).

Graphic
Operates through an advanced Windows-based graphical user interface.

INS
ACN: 003 338 476
Unit 3a, 3 Lanceley Place
Artarmon, NSW, 2064
INFORMATION NETWORK SOLUTIONS
PHONE: (02) 906 - 6335 FAX: (02) 906 - 6327

Category 5
100 MHz
Pentascanner

Shipping Now!

INS
ACN: 003 338 476
Unit 3a, 3 Lanceley Place
Artarmon, NSW, 2064
INFORMATION NETWORK SOLUTIONS
PHONE: (02) 906 - 6335 FAX: (02) 906 - 6327

curate latency measurements between LANs connected by WAN links, regardless of the distance between the LANs.

The application is known as the Remote Latency Measurement Application, and it uses the satellite signals to synchronise the internal clock of DA-30 units connected to both local and remote LANs, resulting in a test accuracy of +/150 microseconds, according to officials.

W&G's new RLMA measurement application uses GPS satellites

To perform the test, GPS Timing Synchronisation Modules are installed in both DA-30s, which are able to 'lock' into the universal time signal broadcasts of four GPS satellites. The application is then able to conduct latency trials using a wide range of intervals in between frame transmissions. The local DA-30 unit logs and displays the test results.

Wandel & Goltermann
(03) 690 6700

Super-Lightweight Mobile Phone

Nokia Mobile Phones has introduced a new series of digital handheld cellular phones called the Nokia 2100 series, which the company claims are the smallest and lightest digital units on the market.

The new phones weigh just 235 grams in standard configuration, or 199 grams with a lightweight Lithium ion battery They feature the same basic design and interface features for GSM, European PCN and US TDMA standards, and the developing Japanese Digital Phone System.

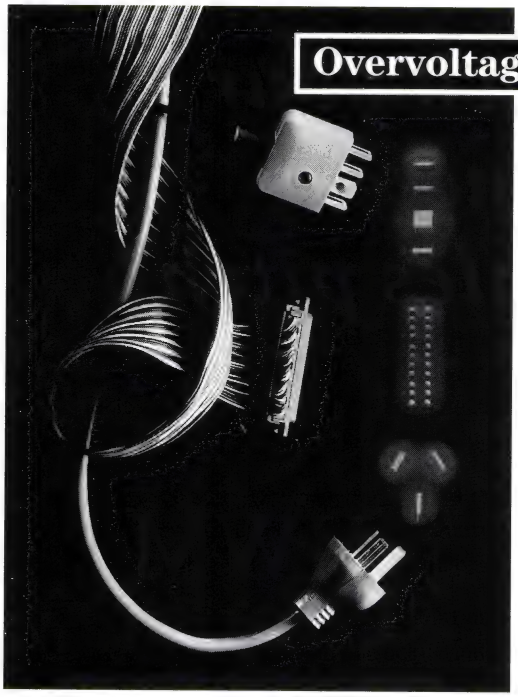
The Nokia 2110 supports a number of sophisticated features such as: text messaging and paging; call hold and call waiting; selective call acceptance; calling line/number identification; data/fax transmission; and increased facilities for international roaming. Many of these features, however, are still awaiting network activation in Australia and are not yet available.

Officials said the model 2110 incorporates an extensive ergonomic feature set which has a high-contrast five-line supertwist LCD display, 30-character readout for names, numbers and prompts, status and menu command lines, and continuous battery, signal strength and digital service indicators.

Officials said a user-friendly interface helps operators negotiate their way through the telephone's programmable features via a series of user prompts, which does away with the need to learn a user manual.

Nokia's 2110 offers users a wide range of sophisticated features

Other features of the unit include: 125 memory locations with recall and send facilities, 99 of which are speed dial, and nine of which offer single key operation; fast battery charging; selectable ring tones and patterns for call identification; and high-speed wireless data/fax support for laptops via the credit card-sized Nokia PC card.



Overvoltages can destroy sensitive electronic systems

Recent advances in microprocessor technology have increased the power of the silicon chip, reduced its physical size and increased its susceptibility to damage or destruction from power overvoltages, spikes or complete power failures.

The consequences of system failure or data loss means the inevitable cost in down time and loss in productivity.

To provide reliable power to your electronic equipment, Critec offers you a choice from an extensive range of on-line and off-line UPS. From 500VA to 3kVA all units have increased surge ratings and are specifically tailored for Australia's adverse lightning conditions.

Critec's engineering experience has been recognised internationally and the Dataguard DG12 UPS has won an Australian Design Award for engineering excellence.

To find out how to protect your operational reliability, simply fill in the form below and either mail it to Critec head office or fax it back to us on **002 73 0399**.

CRITEC
Fax 002•730399 Phone 002•730066
Critec Pty Ltd Box 536 GPO Hobart 7001 TAS
NSW (02) 688 4528 VIC (03) 696 1633 ACT (06) 257 3055
QLD (07) 849 5077 SA (08) 364 2555 NT (089) 41 3880
WA (09) 257 1065 NZ (09) 309 2464

☐ **YES.** Please send me information on the Critec UPS range of reliable backup power supplies and your publication note CRPN03 "Power conditioning – an overview".

NAME ____________________
TITLE ____________________
COMPANY ____________________
ADDRESS ____________________
CITY __________ POSTCODE __________ PHONE __________ FAX __________

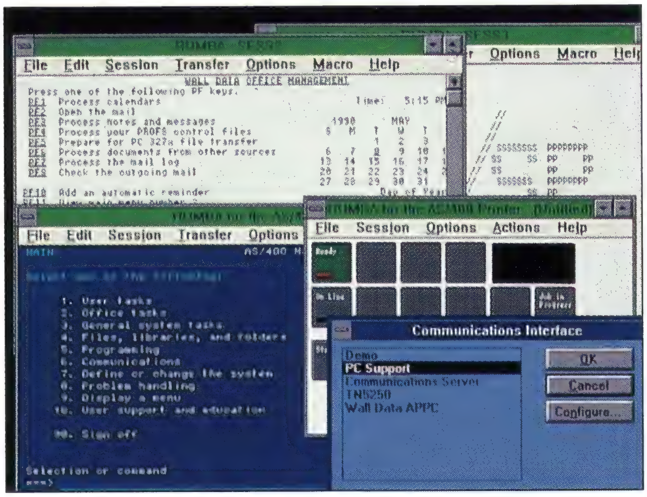
CRC-B029 OZ

The phone comes with three different battery options — the standard Nickel Hydride battery, which provides 70 minutes talk time and 18 hours standby; an extended-life Nickel Metal Hydride pack which offers 180 minutes talk time and 50 hours standby; and the very light Lithium ion battery. The 2110 also comes with a range of hands-free accessories for use in both the car and desktop.

Nokia Mobile Phones
(02) 368 1055

NetWare-to-Mainframe Link

Datacraft has now released Wall Data's Rumba for NetWare Systems, a software package that enables PCs and workstations to access applications from IBM mainframe and AS/400 systems for simultaneous host sessions in a Windows-like environment.



```
                     WALL DATA OFFICE MANAGEMENT
Press one of the following PF keys.
PF1  Process calendars                          Time:    5:15 PM
PF2  Open the mail
PF3  Process notes and messages                 1990       MAY
PF4  Process your PROFS control files          S    M    T    W    T
PF5  Prepare for PC 327x file transfer                   1    2    3
PF6  Process documents from other sources      6    7    8    9   10
PF7  Process the mail log                     13   14   15   16   17
PF8  Check the outgoing mail                  20   21   22   23   24
                                              27   28   29   30   31
PF10 Add an automatic reminder                          Day of Year
```

```
MAIN                                              AS/400 M

      1. User tasks
      2. Office tasks
      3. General system tasks
      4. Files, libraries, and folders
      5. Programming
      6. Communications
      7. Define or change the system
      8. Problem handling
      9. Display a menu
     10. User support and education

     90. Sign off

Selection or command
===>
```

Rumba for NetWare displays directories just like a Windows system

The software connects to an IBM mainframe and/or an AS/400 via NetWare for SAA, or to a mainframe using an SNA gateway. The product is able to support both gateways via IPX/SPX communications, includes both TN3270 and TN5250 Telnet client features to allow workstation access to either host through a TCP/IP network, and also incorporates Novell's LAN WorkPlace TCP/IP protocol, according to Datacraft officials.

Rumba for NetWare Systems also features a simple point-and-click interface, and host directories are displayed in the same format as in normal Microsoft Windows directories. Important data files can be transferred by simply pointing and clicking, and for AS/400 files, SQL statements can also be used to transfer data.

The software's Short Cut Copy & Paste feature saves time transferring data by enabling a Hotlink to be established to bring host data straight into a report, officials added.

The package also supports macros, allows multiple host screens to be transformed into printed reports complete with all formatting information without the need for a print session to be opened, and has advanced program interfaces that integrate all desktop-to-host applications. Host sessions can be commenced simultaneously, and users can customise their keyboards, change display colours, and perform many other functions, said officials.

Datacraft (03) 727 9111

Intel/Novell Unite

Leading PC chip maker, Intel, and leading network operating system vendor, Novell, have teamed up to integrate Intel's LANDesk Manager desktop

How can you reach your target audience and backup your sales pitch?

Order customised reprints of your article or review from AUSTRALIAN COMMUNICATIONS, specially designed to let potential clients read all about you!

For more information contact:
Head Office : (03)-646 7133   Facsimile : (03)-646 7420

HWM
53 JOHNSTON STREET
PORT MELBOURNE, VIC. 3207

AUSTRALIA'S REPRINT SPECIALISTS

HOWE WILDE MANAGEMENT
Wilpol Pty. Ltd. A.C.N. 006 755 139

management system, LAN Desk Virus Protect, and Storage Express with Novell's NetWare Management System (NMS) network management console.

The companies said the benefit of the enhancements to the Intel software were that users would be able to seamlessly access centralised management and backup services for the whole network, from desktop systems to network servers and network services.

From the NMS 2.0 console, network managers can now have a consolidated view of the network showing PCs, servers, routers, printers, network traffic and other network devices and services, said officials.

They said users could navigate through the network by simple mouse-clicks, and could initiate desktop management and backup functions directly from the map on the NMS console. The software can also proactively initiate Intel Storage Express functions on receipt of alerts from failing devices.

The integration between the two vendors' products comes at no cost to the user, and all products will retain their existing pricing. NetWare Management System 2.0 sells for $4,760; NetWare Management Agent 1.5 sells for $855; LANDesk Manager 1.51 is priced at $2,299; LANDesk Virus Protect costs $1,499; and Storage Express sells for between $7,995 and $22,999. The products are available through each company's reseller channel.

Novell (02) 925 3000
Intel (02) 975 3300

W&G Test Products

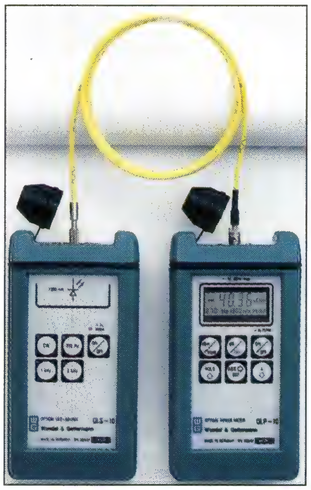
Wandel & Goltermann has released a range of products for technicians installing and maintaining fibre-based networks.

The company's new optical LED sources, the OLS-8 for 850nm and the OLS-10 for 1300nm, provide a stable output power level across a wide temperature range. They are easy to use, and take reliable measurements over more than 20 different kinds of optical connector, said officials. They are protected from dirt, water and shock by a rugged housing.

The new OLP-10 Optical Power Meter measures power and attenuation in the wavelength range between 800 to 1600nm. Officials said the device is especially suited to measurements in the optical windows at 850nm and 1300nm, because of the use of a large germanium photodiode. Callibrated wavelengths of 850nm, 1300/1310nm and 1550nm are provided.

The company said the new devices include a feature of benefit to service technicians who need to make measurements on single fibres in fibre bundles — the ability to modulate the output signal for automatic recognition by the power meter. This simplifies the identification of fibres and helps prevent improper cabling.

Wandel & Goltermann
(03) 690 6700



The OLS-10 can take measurements over 20 connector types

Cisco Beefs Up Model 4000 Router

Leading router vendor, Cisco Systems, has enhanced its Cisco 4000 modular router with the introduction of new high density Token Ring and serial interfaces, a single mode FDDI card

Open Wiring Systems Pty Limited ACN 003 658 857

N.S.W.
28 Punch St, Artarmon 2064
Ph (02) 906 5777 Fax (02) 906 2777

A.C.T.
26 Dunbar St, Fraser 2615
Ph (06) 258 0090 Fax (06) 258 0081

QLD
Suite 6, 30 Argyle St, Breakfast Creek 4010
Ph (07) 862 4100 Fax (07) 862 4144

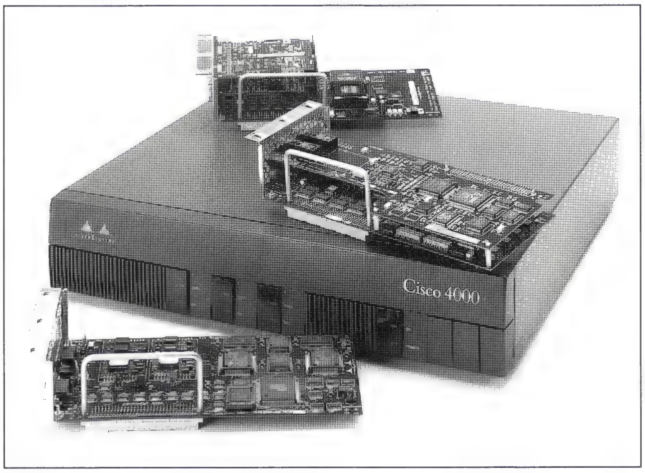
and a DC power supply. The enhancements mean the router can now handle twice the number of Token Ring and serial connections (with support for IBM SNA half-duplex mode) than it previously supported, according to company officials.

The new dual-port Token Ring module can provide connections for two 802.5 Token Ring LANs through standard 9-pin serial connectors and features software-selectable ring speed of 4 or 16Mbps. For serial WAN connections, a new four-port serial interface module supports DTE and DCE modes, full and half duplex modes, and RS232, V.35, X.21 and RS449 media.

The module also supports X.25, frame relay, ISDN, HDLC and PPP wide area links and means that the router can support up to 12 serial connections.

Cisco has also released a new interface module that can now provide the Model 4000 router with direct connectivity to FDDI backbones over single-mode optic fibre media. The module increases FDDI network distance to over nine kilometres, company officials claim. The module also supports Cisco's FDDI fault tolerant and redundancy features, they say.

Cisco Systems (02) 957 4944



Cisco's Model 4000 now has new options for Token Ring and FDDI

FDDI Test Application

Wandel & Goltermann has released a new RTBench application that allows the company's DA-30 Internetworking Analyser to perform tests on FDDI bridges and routers.

Using the new application, users can stress test FDDI routers and bridges at up to 190,000 frames per second for 55-byte frames. By cycling through a series of different sized frames, from 55 to 4,472 bytes, users can accurately determine a router's throughput, packet loss and latency, officials said.

The software offers three test options. A standard test cycles through all of the eight frame sizes to test throughput, packet loss and latency for selected protocols. A quicker test uses only one frame size, while the latency test measures the latency of devices.

The main menu prompts users to select and save the network addresses to be tested, minimising setup time for subsequent tests. Setup parameters include network addresses, bandwidth, packet data information, transmission duration, single or multiple DA-30 modes and transmission warnings settings.

The software can support AppleTalk, DECnet, IP, Novell IPX and XNS for FDDI router testing, and a bridging option is also included for devices which support bridging.

Wandel & Goltermann (03) 690 6700

The PC-based WAN protocol analyser family from Network General

LM2000
The all-in-one tool for todays and tomorrows networks, ASYNC to ISDN to FRAME RELAY from 50bps to 2Mbps.
- RISC processor
- Data monitoring, BERT(G.821), simulation , decodes and statistics
- On-board interfaces V.24, V.35, V.10/V.11, RS449 adapter, E1 and T1 pods
- Real time pre-capture filters
- Frame Relay support for up to 256 DLCIs incl. decodes of embedded WAN/LAN protocols
- Programming languages with built-in library of ready-made test applications

LM1 Olympic Edition
Put the power of a dedicated 72Kbps analyser into a personal computer.
- Data monitoring, capture, emulation and BERT at 72Kbps on V.24, V.10/V.11, V.35
- Full plain-English decodes for X.25/X.75, SNA, QLLC, Q.931, TRANSD, DDCMP and other
- Precapture filtering with up to 6 simultaneous traps
- Level 2 and 3 real-time statistics
- Library of prewritten test scripts

LM1 PocketScope
Zero slot -The first PC-based protocol analyser for WAN testing that does not require an expansion slot. Ideal for portable or on-site desktop PCs.
- Notebook portability
- Remote control from any PC
- Plain English decodes for X.25, SNA, QLLC and other protocols
- Level 2 statistics
- G.821 BERT
- Built-in test libraries and macros.

ISDN tel/scope
LM1 Olympic Edition with on board ISDN interfaces and software tailored for ISDN testing.
- ISDN 2B+D S/T interface
- WAN interfaces V.24, V.35, V.10/V.11
- B- or D-channel protocol support for ISDN BRI and PRI
- Voice and data monitoring in B-channel
- E1 pod for channel access on ISDN/PRI links

CompaSS7
A combination of high performance WAN analyser with an SS7 network analyser supporting up to 4 64 Kbps-links at 100% utilization.

Network General

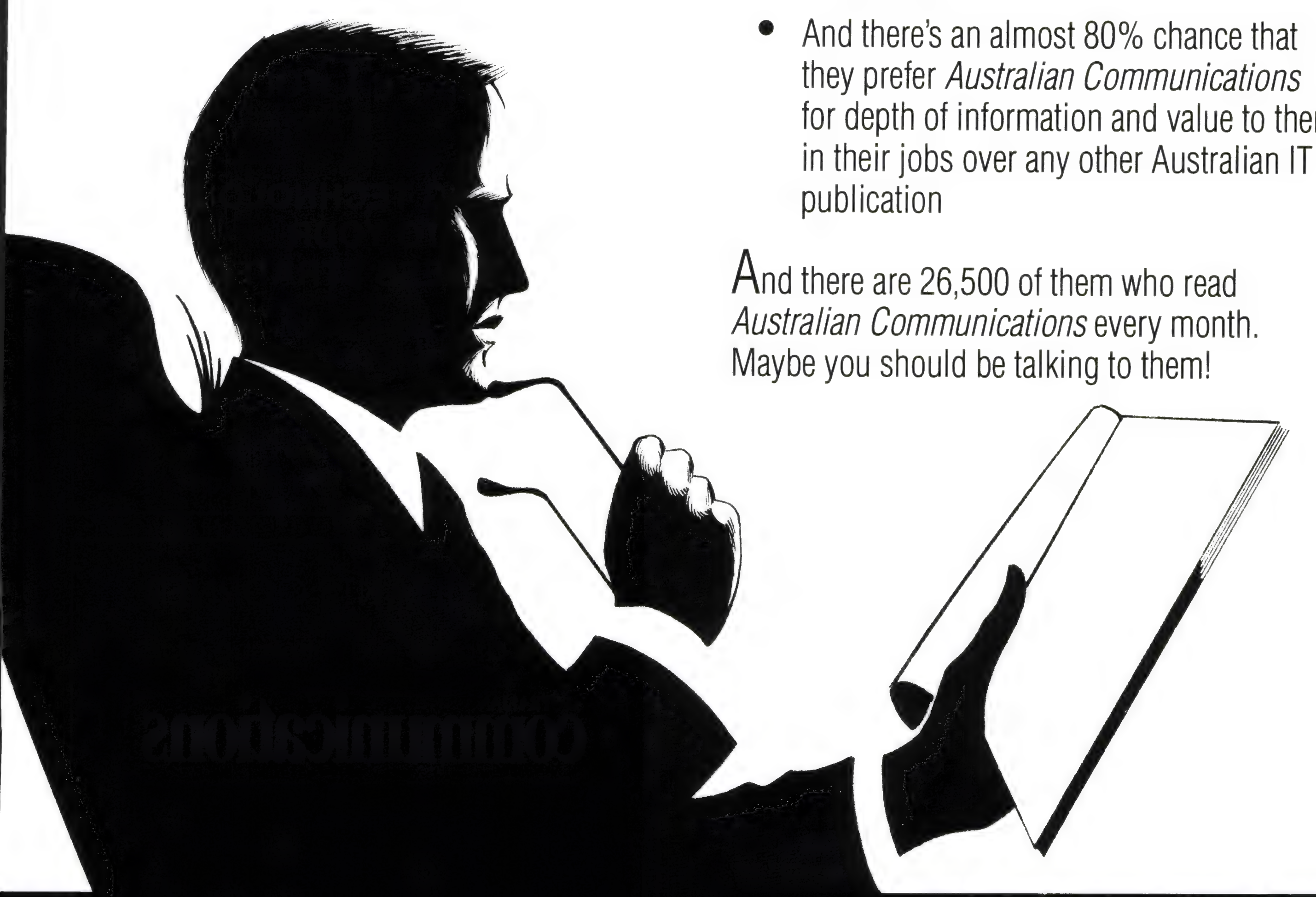
TESTCOM-DATA

217 North Rocks Road, North Rocks NSW 2151
Telephone: (02) 630 7528 Fax: (02) 630 7226

Who is an *Australian Communications* Reader?

- There's a better than even chance that they work for a company with over 500 employees
- There's a 70% chance that they authorise or specify the purchase of data networking products
- It's even money that they run a Novell network or will purchase one in the next 12 months
- There's a 70% chance that they are running Windows or will be in the next 12 months
- And there's an almost 80% chance that they prefer *Australian Communications* for depth of information and value to them in their jobs over any other Australian IT publication

And there are 26,500 of them who read *Australian Communications* every month. Maybe you should be talking to them!



***All statistics are based on the response to the August 1993 *Australian Communications* readership survey conducted by Price Waterhouse, and *Australian Communications'* Audited Paid Circulation.**

For a copy of the complete survey results please contact Craig Burkill or Dawn Switzer on (02) 264 2200.

Price Waterhouse

CONSULTANTS CORNER

ConsulCom Pty Limited

VOICE AND DATA TELECOMMUNICATIONS CONSULTANTS

- Telecommunications Audits and Cost Control
- Telecommunications Strategic Planning
- Telecommunications for Competitive Advantage
- Design and Management of Telecommunications Solutions

CONTACT: PAUL MORRIS

ConsulCom Pty Limited
230 Quarter Sessions Road
Westleigh NSW 2120
Telephone: (02) 484 6851
Facsimile: (02) 484 1114

AAS

The largest . . . . .

. . . . . AAS has on-staff expertise to address the largest and most diverse corporate telecommunications assignments

And the smallest . . . . .

. . . . . and also offer tailor-made Packaged Services

AAS Consulting Services . . . . .
solutions to problems — directions for growth

Telephone: (02) 264 9640
Facsimile: (02) 264 9868

RAM
COMMUNICATIONS CONSULTANTS
OF AUSTRALIA PTY. LIMITED

A COMMUNICATIONS CONSULTANCY

- Mobile Communications
- Radio Engineering
- Telecommunications
- Data Communications
- Systems Integration
- Communications Facility Planning

KEEPING PACE WITH CHANGING TECHNOLOGY

200 Arden Street, North Melbourne VIC 3051
Telephone: (03) 321 0183
Facsimile: (03) 321 0184

the
Yankee Group
Asia-Pacific

LINKING TECHNOLOGY TO YOUR BUSINESS STRATEGY

Since 1970 specialising in strategic analysis of Information Technology market developments.

Ask us for a free information kit.

Telephone: (02) 369 2885
Facsimile: (02) 389 7494

Paul Budde
Communication

Some things in life are FREE!

We KNOW the telecommunications industry and we understand your needs! To prove it we'll give you 3 issues of our Telecommunications Management and Marketing Newsletter . . . FREE. Consider this our way of extending our services to you for the next 3 months!

CALL NOW!

Telephone: (049) 988 144
Facsimile: (049) 988 247
2643 George Downes Drive, Bucketty NSW 2250

CONSULTANTS CORNER

is featured in every issue of

AUSTRALIAN communications

To advertise call
Dawn Switzer on (02) 264 2200

ATUG
AUSTRALIAN TELECOMMUNICATIONS USERS GROUP

Editorial by Wally Rothwell

Who Will Provide Our Infrastructure?

Following on from my theme of last month's editorial — that we need now to start the review of the lead up to full competition in 1997 — there are some questions that will exercise the minds of people in different sectors of our industry, and these will need answers. They are questions like:

- Who will provide the telecommunications infrastructure of the future?
- Will there be a regulatory wedge driven between the providers of facilities and the providers of content?
- Will Telstra be the national infrastructure provider of last resort, in the sense of its universal service obligation?
- And, if so, will private investment be allowed in the national carrier?

Future Infrastructure

Duplication of infrastructure was one of the arguments used by those opposed to competition, in the earlier days of our developing regime of competition.

Why, so the argument went, would you have more than one organisation digging up our streets and putting lines in the ground or launching satellites, when fibre optic and bandwidth compression were giving us access to larger and larger chunks of bandwidth? Was that not wasteful duplication of scarce resources?

The counter arguments ran along the lines that users will always find a way of using spare capacity and, in any case, it would be a commercially foolish facilities provider that provided new capacity that it could not fill or sell.

The latter argument won the day and we have Optus providing fibre capacity, which is finding a demand and which is causing prices to fall. As yet, that admittedly is only occurring on thick routes and city CBDs, where prices are falling faster than they are in country areas — but prices are falling in all areas, uneven though that may be.

So there is another argument that says why not just have one facilities provider, from which everyone buys capacity and either resells or uses. Wouldn't that be fairer for everyone and wouldn't the provision (or waste) of capacity be properly optimised?

The only problem then is that there are already facilities providers in the field. Not only Optus but broadcasters can provide capacity, in the latter case, so long as they do not connect it to the public switched network. But that only applies until 1997.

Carriage and Content

The issue of infrastructure provision becomes complicated if the national provider also is involved in service provision, and in providing content.

How do you achieve an equitable situation if the infrastructure or facilities provider is selling capacity to its own service provider arm at a better price than other service providers can get it? It becomes more complicated if the facilities provider is teamed up with a content provider as in, for instance, interactive Pay TV. The other service providers obviously want to see a clear demarcation between the providers of capacity and the resellers of capacity, so that they receive a fair go.

Austel has recently developed a scheme whereby Telecom's dominance in the cellular mobile market can be controlled effectively, so that, although dominant by way of its monopoly as a wholesaler of AMPS service, it cannot exert that dominance. The use of a compliance manual is the vehicle to ensure accounting separation between MobilNet wholesale and MobileNet retail, along with a number of other safeguards.

Accounting vs Structural Separation

This brings to question whether accounting separation can be made to work. The COA/CAM (Chart of Accounts and Cost Allocation Manual) was made up by Austel to keep the carriers honest in their accounting for products and services. So far, it does not seem to have achieved this aim, despite the best efforts of Austel, almost certainly because compliance with the COA/CAM is an enormous task, especially for Telstra.

The jury is yet to be formed for the trial of the effectiveness of the Compliance Manual for mobile services. It is a good plan and it should work. If it doesn't, ATUG will return to its original proposal for structural separation of the national carrier. MobileNet retail and some other areas of Telstra would lend themselves to such arm's length separation and possibly to private investment.

It would complicate the plans of Austel and undermine the user community's support of the Government's competition policy if private investment was allowed in Telstra as a whole, before these plans are seen to be in place and working.

Wally Rothwell
Executive Director

ATUG
SYDNEY
Level 11, 80 Alfred Street
Milsons Point, NSW, 2061
Australia
Tel: (02) 957 1333, (008) 22 6281
Fax: (02) 925 0880
MELBOURNE
Unit 3, 8-12 Sandilands Street
South Melbourne, VIC, 3205
Australia
Tel: (03) 690 6395
Fax: (03) 699 9094

ATUG'94 PREVIEW

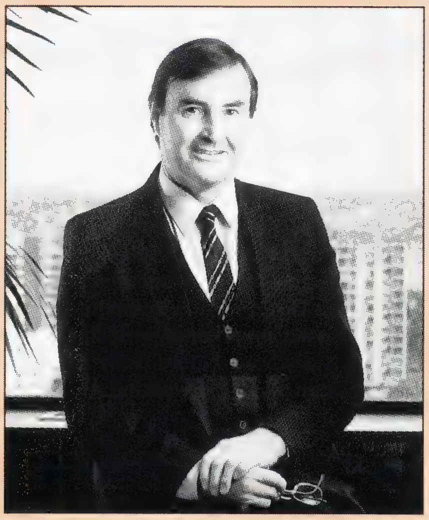
ATUG'94 — Smart Communications for Smart Business

By Toula Mantis

By the end of this year, Telecom is reported to be capable of offering interactive services to 150,000 homes, and promises to have these services in up to 1.1 million homes within three years. Telecom is also believed to be part of a group of international telecommunications and computer companies developing a network standard for delivering multimedia services on the 'information superhighway.'

What's more, Microsoft has agreed to work with Telecom to develop a new generation of interactive, on-line services. So what does this mean for users in Australia? As far as business users are concerned, those who are first to take advantage of the new broadband services may well find themselves a step ahead in the competitive global marketplace. It is no wonder, therefore, that the theme of this year's premier event in Australian telecommunications, ATUG'94, is 'Smart Communications for Smart Business.'

It is anticipated this year's ATUG'94 theme will become the catch-cry of corporate Australia as more and more CEOs realise what a difference smart communications can make to their bottom line. This year's program highlights the future in communications and gives users an opportunity to fully comprehend the imminent changes that will take place in the communications environment in the coming years.



Executive Director, Wally Rothwell, looks at the broader horizons of communications

With this in mind, ATUG'94 will be a milestone as Australia progresses towards the year 2000. This is because ATUG'94 will have provided users with a chance to be better prepared for the communications revolution — which will be just as important, over the next six years, as the introduction of the motor vehicle early this century.

Thus, if you want to have your say about the future of communications services or if you want to learn how to take advantage of the new communications offerings, then ATUG'94 is the place to be, from Monday, 2nd May to Thursday, 5th May, 1994. The annual four-day conference and exhibition will be held in Melbourne at the Royal Exhibition Buildings.

As always, the four day event begins with a communications update seminar. However, this year the conference organisers have added a 'Telecommunications Basics Forum' and an 'Open Learning Forum.' The Telecommunications Basics Forum is aimed at users wanting to learn better ways of doing business with the telecommunications industry. The Open Learning Forum has been included to cater for communications in education. Other new features include a networking lounge for delegates, and a later start on Thursday following dinner on Wednesday evening to allow exhibition browsing.

The three days following the update seminar live up to the promises made by the organisers — that this year's event will provide more practical workshops and case studies, and will encourage discussions about computer, broadcasting and telecommunications convergence. All in all, there are 70 speakers, nine technical and policy sessions, and 17 Master Class workshops ranging from topics on management survival, spectrum management and voice processing innovations to the Sydney 2000 Olympics communications strategies and planning.

ATUG'94 Exhibition

On the exhibition side, ATUG has taken the approach that the new-generation communications technologies should be demonstrated so that users can actually see what is being discussed during the conference. This is why ATUGnet, dubbed the 'ATUG Interop.' network, has been introduced to the 1994 program. It is the first exhibition-wide network for demonstrating interoperability by exhibitors to be held in Australia.

As usual, the exhibition will be used to launch new products, and these will be complemented with several organised exhibitor presentations. Users should take advantage of these presentations, as they provide an opportunity for the demonstration of new products. ATUG'94 organisers are expecting up to 30% more exhibitors at this year's exhibition than at last year's exhibition.

Communications Update Seminar

If you are interested in getting an overview of developments in telecommunications during the last twelve months, then this is the day for you. The Communications Update seminar will begin with an update address by ATUG's chairman, George Maltby. ATUG's Executive Director, Wally Rothwell, will also take the podium to give an overview of developments from a users' point of view.

ATUG'94 PREVIEW

In addition, Austel's Chairman, Robin Davey, looks at the first five years of Austel and beyond, specifically drawing attention to issues such as market dominance, charges for numbers, the numbering plan, privacy and preselection of enhanced services. Following the theme of convergence, Austel's Dr Bob Horton takes a look at developments in wireless and fixed convergence. The session ends with an overview from the press gallery by *Australian Financial Review* journalist, Helen Meredith. Ms Meredith was the winner of the ATUG'92 award for the Telecommunications Journalist of the Year.

Telecommunications Basics Forum

This session is a must for anyone who wants to know just where users stand with the big telephone companies, especially now that Australia has a competitive telecommunications regime in place. The recently appointed Telecommunications Industry Ombudsman, Warwick Smith, will cover the basic services rights of telecommunications consumers, while AAP National Marketing Manager, Wayne Moloney, will provide practical tips on saving money by knowing when and how to switch telephone companies.

More practical advice is given by ATUG Director and Managing Director of Consulcom Pty Ltd, Paul Morris. He will explain the peculiarities of telephone bills and will use case studies to demonstrate how users have had to pay more for their telecommunication needs. He will also show how to audit the use of the telephone so that unnecessary costs can be eliminated.

Open Learning Forum

Open Learning is one example of an interactive service where students have the ease and flexibility of studying at home via television. According to ATUG Director and General Manager of Open Learning Technical Corporation, Julie Carr, the forum will provide a meeting ground for educators and providers. "Without improved dialogue and understanding between the two groups, the potential of the new telecommunications technologies will languish," she said. This forum will investigate how the new communications services will impact learners and educational organisations as well as giving a provider's perspective on this issue.

Presenting an international perspective on the economics of convergence in open learning will be Canada-based Open Learning Agency's research and strategic planning Executive Director, Dr Tony Bates.

DAY ONE

The first day of the conference is Tuesday, 3rd May, 1994. The four topics to be covered are: national infrastructure planning; national resource management and planning; network interconnection; internetworking and transport. With Olympic fever still in the air, the recent games in Barcelona will be discussed from a telecommunications point of view. This will be followed by a discussion about telecommunications for the Sydney 2000 Olympics.

Other highlights include discovering what is in store for users in Australia via satellite, and how Australia may once again be a world leader in communications tech-

The Value of ATUG Membership

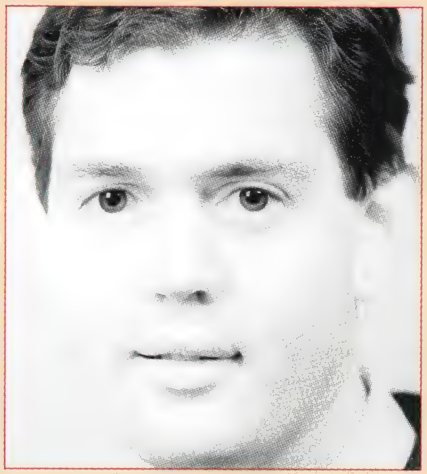
Can you afford to be without the up-to-date knowledge, provided by ATUG membership, on the evolution of convergence in the media, communications and computer industries?

As a member of ATUG you receive:

⇒ One year's free subscription to the monthly ATUG newsletter, 'Newsbrief';
⇒ One year's free subscription to *Australian Communications*;
⇒ Discount rates to the telecommunications event of the year, ATUG's annual four-day conference and exhibition, ATUG '94;
⇒ Discount rates to ATUG seminars and workshops;
⇒ Free admittance to ATUG special member meetings;
⇒ Free assistance on matters concerning telecommunications;
⇒ Representations of your views to Austel and the Government;
⇒ A forum to exchange ideas with your peers in the industry;
⇒ A telecommunications library service;
⇒ Member rates for ATUG products and services;
⇒ Expert legal advice from ATUG's Legal Line service; and
⇒ An overall saving on your next communications bill due to ATUG's lobbying activities.

If you have any queries about your ATUG membership, call ATUG's business manager, Owen Richards, on (03) 690 6395. Members in Queensland may contact ATUG's business manager, Ray Poon, on (07) 870 4484. Members in Western Australia may contact ATUG's WA business manager, Geoff Groves, on (09) 450 3485.

ATUG'94 PREVIEW

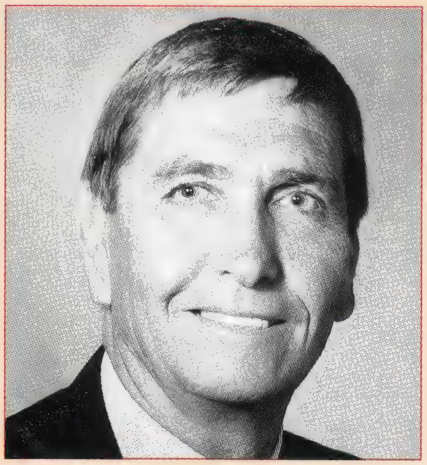


Special guest speaker, BTCE's Chris Cheah, will talk on communications futures policy

nology. The Australian Broadcasting Corporation's director for strategic development, Rosemary Sinclair, will discuss this topic.

Australia Pioneering ATM

The method of switching discrete data, voice or image units in 53-byte 'cells' is called Asynchronous Transfer Mode (ATM). This method of communications has been creating a huge amount of interest. ATUG award winner, Professor John L. Hullett, is working in this area with the Australian Telecommunications Research Institute and with the Cooperative Research Centre for Broadband Telecommunications and Networking. "Australia is pioneering an ATM approach which offers all the promised benefits of ATM with none of the disadvantages. The switches used in the Australian architecture employ ATM-based distributors and concentrators and provide an operational environment that is optimum for both real time services, such as voice and video, as well as data," he said. His presentation is titled 'ATM Enterprise Networks — The Unstoppable Way Ahead?'



FOCOM's Frank O'Brien . . . what is the appeal of interactive TV?

Six Master Classes

There will be six Master Classes held on Day One of ATUG'94. These will cover the topics: management survival; convergence; industry salaries and benefits; enhanced facsimiles; and spectrum management. Special guest speaker, Research Manager for the Communications Futures Project in the Bureau of Transport and Communications Economics (BTCE), Chris Cheah, will be the workshop leader for Master Class 3 titled 'Convergence Policy Development.'

This workshop will provide a forum for views on the key medium-to-longer term trends in technologies and markets; and from those identify important issues for future policy development. Cheah says the accelerating convergence of the entertainment, information technology and communications industries is introducing new complexities in technologies, corporate positioning and market structures. "This is likely to raise a new set of challenges for public policy, particularly as the Government considers the regulatory and related arrangements in the post-duopoly (1997) environment with a view to enhancing rather than frustrating Australia's opportunities into the end of this decade and beyond. A particular focus at ATUG'94 will be on the implications of technological and structural change for competition policy in communications," he said.

DAY TWO

The second day of the ATUG'94 conference is Wednesday, 4th May, 1994. The main themes to be covered on this day will be: concepts and visions of future services; the law, policy and practice of convergence; network management and security; and network services and distribution systems.

Traditionally, this has been the day when the carriers' chiefs take the podium and give an insight into the activities of their companies. This year Telecom's Chief Executive Officer, Frank Blount, and Optus' Chief Executive Officer, Bob Mansfield, are joined by Vodafone's Managing Director, John Rohan, AAP Telecommunications' Chief Executive Officer, Barry Wheeler, Austel's Chairman, Rob Davey, and the Australian Broadcasting Authority's Chairman, Brian Johns.

They will all be looking at issues concerning Australian and global telecommunications, with particular emphasis on where Australia is placed in the global communications market. They will also discuss future broadband services and the Australian information highway planning process.

Interactive TV

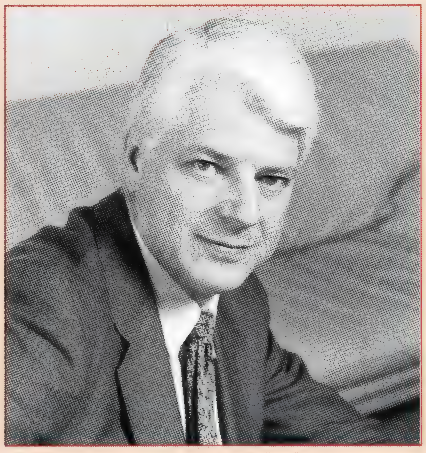
Interactive video to Australian homes is a subject close to many users' hearts. Telecommunications and information technology consultant, Frank O'Brien, will cover this area by asking questions such as 'What is all the excitement about interactive television?' According to O'Brien, most of us would just like to watch some reasonable movies without too many ad breaks.

"Unfortunately technology marches on, and even before Pay TV delivery issues have been resolved, fierce competition is developing over who will control the inter-

ATUG Legal Line Service

Members should take advantage of ATUG's Legal Line Service. The service is run by ATUG director and chairman of ATUG's Legal sub-committee, Gerald Wakefield. Members with legal queries regarding international telecommunications law and regulatory policy; radiocommunications; broadcasting and satellite law and policy; computer technology law; and intellectual property law are advised to seek this communications legal advice service by calling ATUG on (02) 957 1333.

ATUG'94 PREVIEW



SBS Managing Director, Malcolm Long, gives a case study

active box in your home. For example, Grundy has given up game shows to concentrate on interactive services, Optus has gone into home shopping and Telecom is in bed with the Seven Network. So, what is the appeal of interactive television?" he asks.

If you are interested in learning how one national television organisation is responding to the fast evolving audio visual environment, you should attend a presentation by the Managing Director of the Special Broadcasting Services, Malcolm Long. His presentation is entitled: 'New Services and New Cultures — Organisation Strategies and Tactics: A Case Study — SBS."

Law Loops

On convergence law, policy and practice, Jane Levine, partner with the Sydney-based law firm Allen, Allen and Helmsley will cover the areas of convergence conflicts under current legislation. Specifically, she will discuss the *Australian Radio Communications Act,* the *Australian Broadcasting Act,* the *Australian Telecommunications Act,* Australian copyright law, privacy and criminal legislation, the *Australian Privacy Act,* the *Australian Satellite Act,* and national models and Australian options post-1997.

Teleworking

Telecommuting is another subject dear to many users. The option of being able to work from home a few days a week does have its appeal for many commuters, especially for those who have to drive up to two hours to get to and from work each day.

According to AWA Networks' Marketing Product Manager, Gavin Dyer, telecommuting workforces will double by 1995. His presentation is entitled: 'Telecommuting — technology, cultures and opportunities.' He will discuss what teleworking is, and its implications for employees, employers and small business. He will also illustrate the powerful impact of teleworking on business operations and examine the market emergence of teleworking by means of analysis, trends, statistics and locations.

Network Management

On the general theme of network management and security, Intel Australia Pty Ltd's general manager, Geoff Healey, will consider how smart hardware and software communications technologies can be combined in an integrated, automated networking environment.

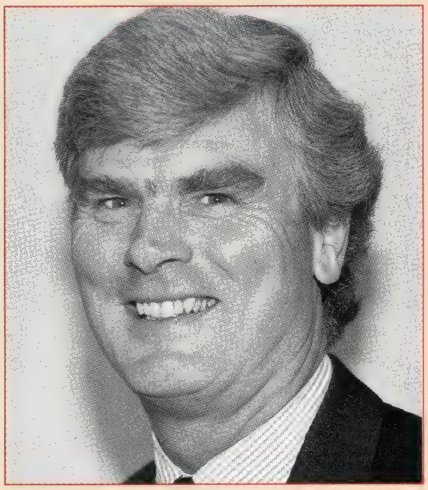
"Communications and computing technologies are merging in response to the demand for global communication links, thus creating a new class of PC communications applications and enabling new ways of interacting, developing ideas, prioritising information, and competing in the worldwide marketplace.

"At the same time, LANs have become integral to the successful operation of many organisations. As this trend continues and as networking technology matures with new communications applications, the computer industry is experiencing vigorous demand for simple methods of managing standard networked desktop systems," he said.

Multimedia

NorTel's account Vice President for carrier networks marketing, Graeme Barty, will give a general overview on multimedia concepts and developments. "It is interesting to note the timing of the information superhighway. Why is it that many companies are now taking the information superhighway seriously? The reason is because there is a demand for broadband services today from a marketplace that is made up of a generation of computer-literate users. In addition, the delivery mechanisms for new digital services are also present today, whereas they were not in the past," he said.

He will examine both the broadband phenomenon and its effects on users, businesses and governments.



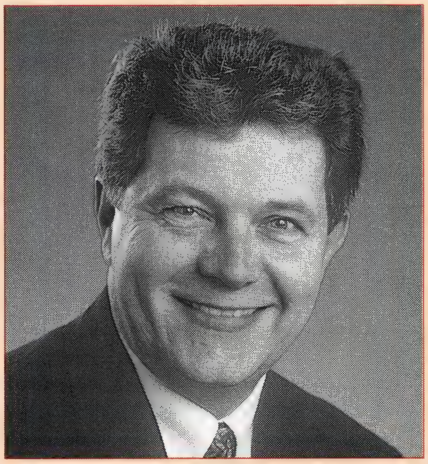
AWA Networks' Gavin Dyer . . . telecommuting will double by 1995.

More Master Classes

The six master class workshops held on the second day of the conference will cover the following topics: ATM; network benchmarking; radio packet-switched networks; voice processing; telecommunications tenders; and telecommunications tariffing.

DAY THREE

ATUG'94 ends on Thursday, 5th May, 1994 with the traditional yearly debate. This year the debate may be on number portability because of its impact on competition, or on broadband services, or on any other topic that arises as an issue during the conference period. One thing is certain, however — it



Intel's Geoff Healey covers integrated automated networking

ATUG'94 PREVIEW

NorTel's Graeme Barty . . . timing of information superhighway is interesting

will definitely be an afternoon that should not be missed, based on past experience.

The two main themes of the final day of ATUG'94 are mobile and wireless planning, and information work and workers. Only five Master Class workshops will be held on the last day of the show. These will cover the topics: managing customer service; resale and service provision opportunities; Sydney 2000 Olympics communications; video delivery options; and new network management.

Of special interest is workshop Master Class 15 entitled: 'Video Delivery System Technology Options for Australian Environments and Regulation.'

This Master Class will be led by AWA Networks' general manager, Joe Younane. Joe will focus on the delivery options and discuss topical related issues such as satellite, cable, microwave (MDS), copper (ADSL) and the possibilities of various combinations of each of the above.

In addition, he will cover the expected implementation timetable and the potential cost implications to users as well as the major hurdles to be overcome on the basis of overseas experience. Other related topics that Joe will discuss include encoding and issues relating to the market, and he will also make an examination of questions concerning the regulatory environment.

Special Closing Presentation

ATUG'94 will close with a special multimedia presentation which will summarise in a visual way what the information superhighway may look like. Be sure to stay for the grand finale — it promises to be an event not to be soon forgotten, and will serve as a perfect close to this year's exciting show!

AWA Networks' Joe Younane looks at the video delivery cost implications to users

Visions & Realities

To summarise, ATUG'94 will consider the coming services and will give users the forum to discuss their problems and challenges in today's communications. Further, the four day event will also provide users with a core of practicalities spiced with a crystal ball gaze into the future. Hence, ATUG'94 is 'education,' 'innovation,' and 'networking' — but, above all, it gives users a sense of direction and practical advice as we head for digital broadband communications during the next six years.

Information Superhighway at ATUG'94

The information superhighway has come to ATUG'94 in the form of the 'ATUG Interop. Network' (A.I.N.), and it has already sparked great interest among many of the exhibitors.

ATUG invites ATUG'94 visitors to view the Network Operation Centre, which will be located in the main exhibition area of the Royal Exhibition Buildings, to see this innovative project in action.

A.I.N. is a first for telecommunications exhibitions in Australia. ATUG aims to demonstrate operational systems and encourage interoperability between different networking environments. Thus, ATUG'94 visitors will be able to see a real information superhighway operating on-line during the four-day period of the 11th telecommunications and data networking exhibition and conference.

The A.I.N. will provide access for data, voice and video connection around the exhibition and remote locations. It will be jointly managed by ATUG and JNA Network Services. The fibre infrastructure will be provided by MM Cables.

A wide range of systems will be served by the A.I.N., from telephones, PABXs and video systems to hubs, routers, local area networks and wide area network systems. A.I.N. also includes access to the global research network, Internet.

The A.I.N. will comprise an FDDI backbone to provide bandwidth to the entire exhibition space and a layer of routers and concentrators to provide connections between the backbone and exhibitors' systems and the outside world.

ATUG

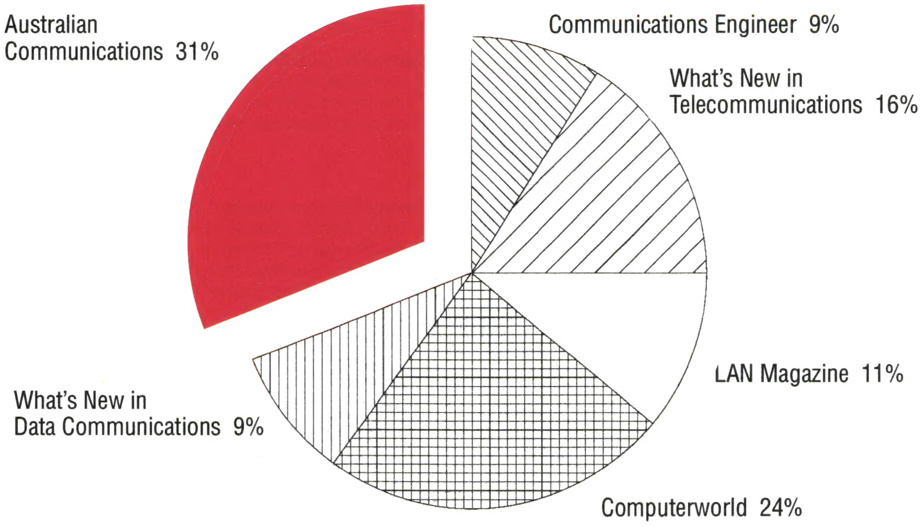
SYDNEY
Level 11, 80 Alfred Street
Milsons Point, NSW, 2061
Australia
Tel: (02) 957 1333, (008) 22 6281
Fax: (02) 925 0880
MELBOURNE
Unit 3, 8-12 Sandilands Street
South Melbourne, VIC, 3205
Australia
Tel: (03) 690 6395
Fax: (03) 699 9094

Which publication is read by more communications professionals?

ATUG - The Exhibition and Conference of the Australian Telecommunications Users Group is unquestionably the major communications event in Australia. Visitors to the annual event are widely considered to be the region's top communications professionals, responsible for the lion's share of its networking and telecommunications purchasing.

Upon registering at ATUG'93 visitors were requested to indicate the communications/networking publications they regularly read. Judging from the **4,690*** completed questionnaires *Australian Communications* is clearly the choice of communications professionals

" I regularly read...."



Data supplied by Riddell Exhibition Promotions, organisers of ATUG'93

* Does not include conference delegates, pre-registrations, or visitors with completed coupons from advertisements in *The Australian* and *Australian Communications.*

AUSTRALIAN
communications
The Data and Telecommunications Management Magazine

International Advertising Representatives

Head Office
AUSTRALIA & NEW ZEALAND
Australian Communications
4/541 Kent Street
Sydney NSW 2000
Australia
Ph (02) 264 2200 Fx (02) 264 2244

USA & CANADA
M&T International Marketing
Miller Freeman Inc
411 Borel Drive Avenue
San Mateo CA 94402
Ph (415) 358 9500 Fx (415) 358 9739

EUROPE
A-Z International Sales
70 Chalk Farm Road
London NW1 8AN
United Kingdom
Ph 71 284 3171 Fx 71 284 3174

JAPAN
Media Sales Japan Inc
Tamuracho Building
3-3-14 Shimbashi
Minato-ku Tokyo
Japan
Ph 3 3504 1925 Fx 3 3595 1709

TAIWAN
Acer TWP Corp
4F 19-1 Lane 231
Fu Hsing N. Road
Taipei 104
Taiwan
Ph 2 713 6959 Fx 2 715 1950

KOREA
Jes Media International
5th Floor Banpo Building
40-7 Chamwon-Dong
Seocho-Gu Seoul 137-030
Korea
Ph 2 545 8001/2 Fx 2 549 8861

HONG KONG
Acer TWP Corp HK
Unit 2, 5th Floor
82-84 To Kwa Wan Road
Kowloon
Hong Kong
Ph 764 3857 Fx 764 3857

SINGAPORE
Eastern Publishing Associates
1123 Serangoon Road #03-01
Singapore 1232
Ph 296 6166 Fx 298 7551

ISRAEL
Nora Lifton
Kfar Saba 44444
Israel
Ph 52 970065 Fx 52 953194

April

11-15 **Investments and Joint Ventures in Asia-Pacific**, Hotel Intercontinental, Sydney. Aimed at the development of international alliances and investments, this summit will bring together leading personalities, senior-level investors, bankers, financiers and business leaders from the computer, communications and telecommunications sectors from a wide range of countries within the Asia-Pacific, North America and Europe. Enquiries — IC&C World Leaders Council Tel: +1 703 476 0664 Fax: +1 703 476 2924.

13-15 **Voice '94**, Golden Gate Hotel, Sydney. This event consists of three separately bookable days that each focus on specific issues of voice communication. Speakers will discuss how their organisations manage, design and maintain their voice communications and CPE, and participants will learn how they can cut their company's telecommunications costs and improve the delivery of communications services. Fee: $895 for any single day; $1,395 for two days; $1,995 for three days. Enquiries — AIC Conferences Tel: (02) 210 5777 Fax: (02) 221 7773.

13-15 **National Convergence Symposium '94**, Hotel Inter-Continental, Sydney. This event will focus on issues raised by the imminent convergence of telecommunications, computing and broadcasting, such as how a national information superhighway might be used and the issues for competition; royalty tracking for intellectual property issues; and organisational strategies to take advantage of the new interactive network. Fee: $1,895. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

18-20 **Fleet Mobile Communications**, Ritz Carlton, Double Bay. This event is aimed at professionals responsible for the operation of corporate fleets, and focuses on new communications technologies and management issues. Topics covered include: radio system design; fleet communications development implementation and management; eradicating interference; developments in IVHS; and the two competing digital standards. An optional third-day CAD workshop will provide attendees with a fully functional call dispatching environment integrated with a GIS. Fee: Two-day conference and workshop $1,695; Conference only $1,395; Workshop only $495. Enquiries — AIC Conferences (02) 210 5777 Fax: (02) 221 7773.

18-20 **India Telecommunications '94**, Holiday Inn Crowne Plaza, New Delhi. This conference is designed to help telecommunications professionals identify and assess opportunities provided by the recent deregulation of the Indian telecommunications market. Overseas attendees can learn about the possibilities for foreign investment, joint ventures and international cooperative developments, and how they can benefit from policy reforms and restructuring of the Indian telecommunications sector. There will also be an exhibition accompanying the conference. Fee: $US1,895. Enquiries — IIR Conferences Tel: +852 549 5618 Fax: +852 547 3836.

25-28 **The Second Annual Pan Asian GSM Summit**, Kowloon Shangri-La Hotel, Hong Kong. This three-day conference with optional one-day workshop aims to keep communications professionals up-to-date with recent developments in the adoption of GSM throughout the region. There will be a wide range of high-level international speakers encompassing all aspects of the GSM market — technology, standards-making, government regulation and carriers. The workshop will be conducted by a group from the ETSI Technical Committee, Special Mobile Group. Fee: Four days $US2,495; three-day conference only $US1,895; workshop $US995. Enquiries — IIR Tel +852 549 5618 Fax: +852 547 3836.

25-29 **Africa Telecom**, Cairo International Conference Centre, Cairo. The theme for this year's conference is 'Integrating Africa Regionally and Globally,' and will cover telecommunications financing and investment in Africa, regional tariff structures, infrastructure development and broadcasting and technologies for remote areas. Africa and the Middle East region is an important telecommunications market, with an estimated demand for new telephone subscriber lines of 16 million and predicted investments of $US24 billion before the end of the century. Fee: SFR1500. Enquiries — ITU Africa Telecom 94 Forum Tel: +41 22 730 5811 Fax: +41 22 730 6444.

27-28 **IT Telecommunications Outsourcing**, Hotel Inter-Continental, Sydney. This event helps corporate managers come to grips with the difficult issues involved in outsourcing one of any company's most crucial facilities — its communications infrastructure. The conference looks at which IT/telecommunications services should be outsourced (and which should not); the key issues involved in selecting an outsourcing supplier; and alternatives such as co-sourcing and joint venture partnerships. A one-day workshop will provide more comprehensive practical knowledge. Fee: Three-day conference $1,895; Two-day conference $1,395; One-day workshop $795. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

May

2-5 **ATUG '94**, Royal Exhibition Buildings, Melbourne. With the theme of 'Smart Communications for Smart Business,' the 11th annual exhibition and conference of the Australian Telecommunications Users Group will feature a variety of international and domestic speakers and exhibitors. A special emphasis will be placed on data networking in Australia. Enquiries — ATUG Tel: (02) 957 1333 Fax: (02) 925 0880.

10-11 **Cellular — The Next Generation**, Waldorf Hotel, London. Organised by the Federation of Communications Services, the representative body for the UK mobile communications industry, this conference looks at the development of cellular technology beyond GSM and D-AMPS, to technologies such as CDMA, SDMA, satellite mobile telephony, GPS, and E-TDMA, as well as new developments in analogue cellular. The focus will be on the business applications of these up-and-coming services, and to give corporate decision makers a basis for long-term strategic planning. Fee: FCS Members £675, Non-Members £695. Enquiries — The Federation of Communications Services Tel: +44 81 778 5656 Fax: +44 81 778 8402.

23-24 **Learning Networks for the 21st Century**, Sheraton Towers Southgate, Melbourne. The event, organised by the Centre for International Research on Communication and Information Technologies, will look at the topic of telematics, examining themes such as: approaches to learning in a mature telematics environment; technological and service trends like narrowcasting and multimedia; moves towards designer learning systems; and the important elements of an Open Telematics Strategy for Australia. Enquiries — CIRCIT Tel: (03) 616 8888 Fax: (03) 616 8800.

25-27 **Telecommunications R&D**, Holiday Inn Menzies, Sydney. This three-day conference features speakers from Australia's leading telecommunication research organisations, both in the public and private sectors. It will focus on the crucial issues in R&D expenditure including: future windows of opportunity; market conditions in SE Asia; the value of strategic alliances and collaborative R&D; using government programmes; speeding R&D cycles; and intellectual property rights. Fee: $1,895 for three days, $1,395 for two days. Enquiries — IIR Conferences Tel: (02) 954 5844 Fax: (02) 959 4684.

June

8-11 **CIETE '94**, Shanghai Exhibition Centre, Shanghai. The 4th International Electronic and Telecommunications Exhibition and Conference on Communication Technology will present the latest products and trends in telecommunications and electronics. Enquiries — Worldwide Conventions and Expositions Tel: +852 375 7721 Fax: +852 375 0686.

30-1/7 **PTC Mid-Year Seminar**, Regent Hotel, Sydney. The theme of the mid-year conference of the Pacific Telecommunications Council will be 'Bridging National and Business Cultures: Strategic Alliances in Communications.' Enquiries — Pacific Telecommunications Council Tel: +1 808 941 3789 Fax: +1 808 944 4874.

July

1-5 **Telecom China '94 Telecommunications Equipment Exposition**, Guangzhou International Exhibition Centre, Guangdong Province. This exhibition provides an opportunity for overseas companies to gain wide exposure in the lucrative and fast growing Chinese market. Enquiries — Union Fair and Trade Development Tel: + 86 20 888 2823 Fax +86 20 884 9074.

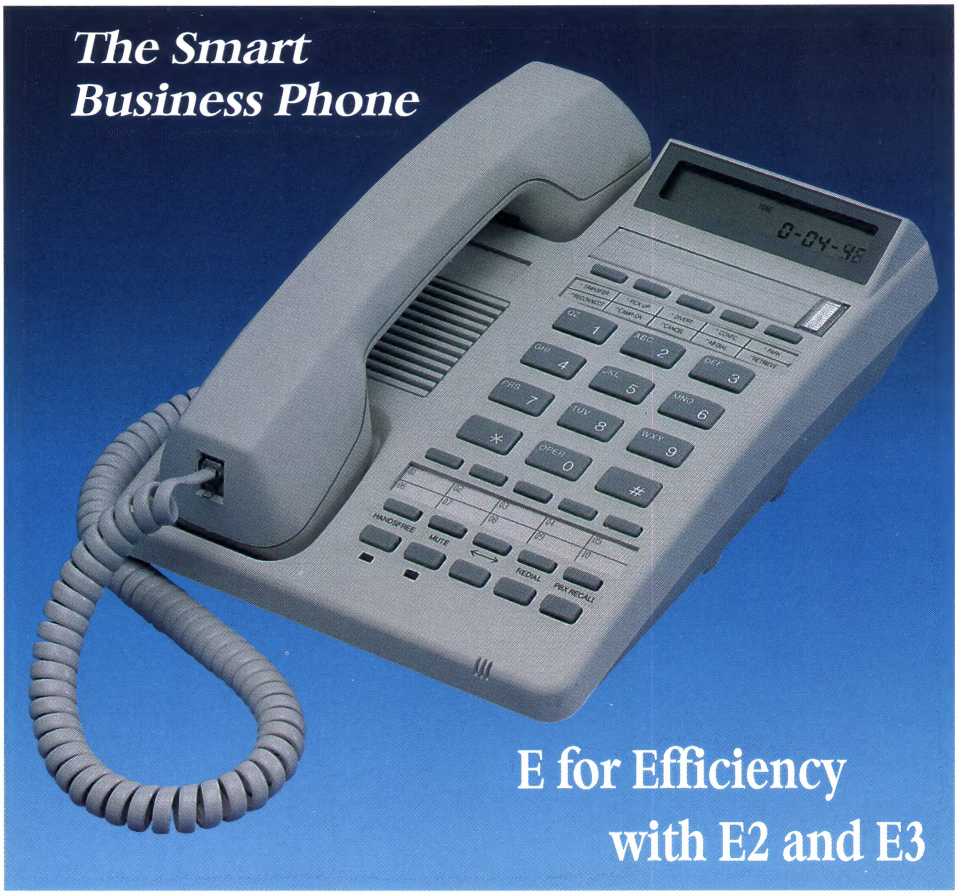
3-6 **International Telecommunications Society 10th Annual Conference**, Sydney Convention Centre, Darling Harbour, Sydney. This year's conference will look at the convergence of telecommunications, mass media and computer technologies brought about by developments in intelligent interconnected systems. The event will focus specifically on the areas of broadband infrastructure and user requirements; regulation of the industry; competition issues; and the contribution of telecommunications to economic growth. Enquiries — Donald Lamberton, ITS Tel: (06) 249 3884 Fax: (06) 249 0312.

August

3-6 **TUANZ '94**, Ellerslie Function Centre, Auckland. Planning for the annual conference and exhibition of the Telecommunications Users Association of New Zealand is underway, and organisers are planning expanded exhibition space and a comprehensive conference and workshop programme. Enquiries — TUANZ Tel: +66 9 488 1602 Fax: +66 9 489 9515.

October

25-28 **Communications India**, Pragati Maidan, New Delhi. This trade show will display a full range of telecommunications hardware and software in the areas of voice, data, text, visual display and radio. An associated technical conference will examine cellular mobile, networking, rural telephony and network privatisation. There will also be keynote presentations by the ITU, UNIDO, the World Bank, the Indian Department of Telecommunications and the Telecom Equipment Manufacturers Association of India. India is one of the fastest growing telecommunications markets worldwide. Enquiries



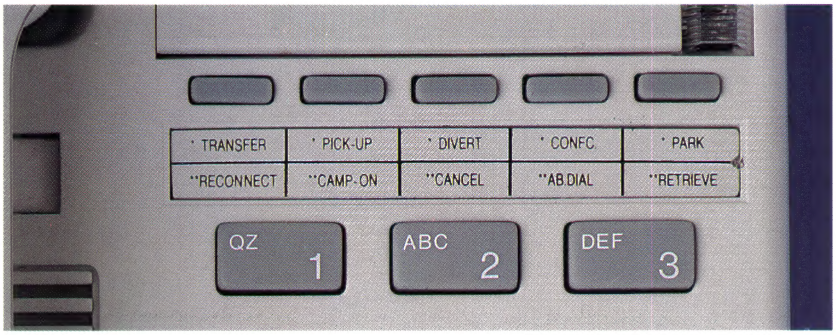
IQTEL E3

- Liquid crystal display
- Clock
- Handsfree / conference operation
- Adjustable earpiece and handsfree speaker volume
- Line powered
- Memory capacity 20 Telephone numbers or PABX commands including 10 numbers with non-erasable Eeprom insertion
- Soft touch number key pad
- Colour Grey

IQTEL E2

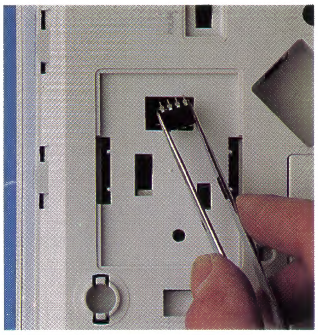
On Hook / Monitor Dialling Version

The following feature is optional



These phones not only look good, they will help you through the business day.

Easy to identify, easy to use PABX or carrier network facilities.



We fit this optional, specially masked Eeprom, permanently pre- programmed with your PABX or carrier network facilities

Maybe it is just checking the time or a telephone number being dialled from the display, talking handsfree or dialling on hook, phoning a colleague with one key touch or instructing the PABX or carrier network facilities to "call forward" your calls by one touch of a memory key. Whatever your job is, you will find E2 or E3 a very dependable workmate.

E2 and E3 can be purchased with customised pre-programming of PABX or network services such as Centel/Customnet/Centrex facilities as illustrated on the left of this page. The pre-programming is on a permanent basis, and will result in all staff being able to easily identify and use the PABX or Carrier facilities. The training time of staff in telephone feature use can be greatly reduced or even eliminated with E2 and E3.

E2 and E3 are not only business phones, they are ideal for home use when purchased with Telecom's "Easy Call" facilities pre-programmed into Eeprom memory for one touch activation.

PLEASE NOTE: E2 & E3 MODELS AVAILABLE DECEMBER 1993.

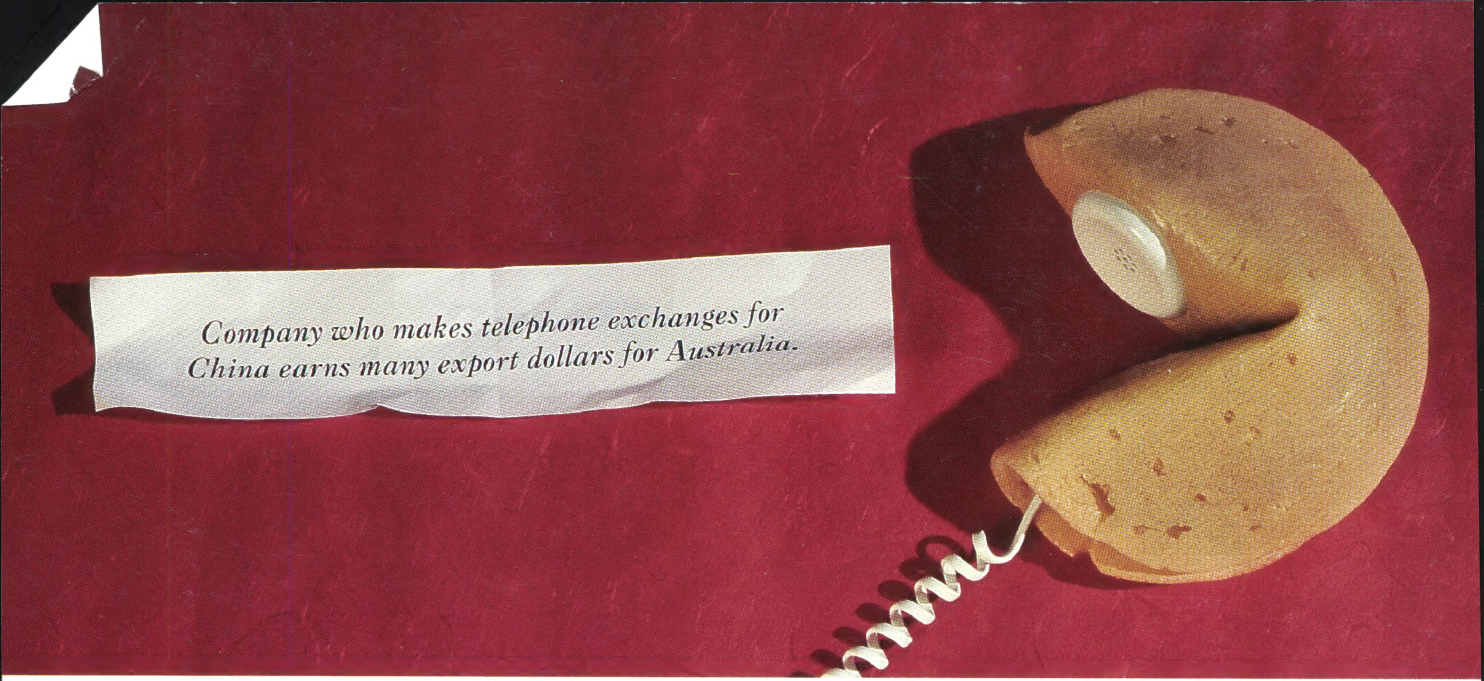
IQ INTERQUARTZ® – The Manufacturers and Distributors

INTERQUARTZ (A'ASIA) PTY. LTD

Melbourne Phone: (03) 457 5000
Fax: (03) 458 4049

Sydney Phone: (02) 875 4011
Fax: (02) 875 4146

Brisbane Phone: (07) 808 8008
Fax: (07) 808 8080



Company who makes telephone exchanges for
China earns many export dollars for Australia.

Alcatel Australia has cracked the fiercely competitive market of China. We've had the good fortune of winning contracts for our System 12 digital telephone exchanges in several regions. Sales to China of this switching system are earning Australia millions of dollars in exports. Add this to the $100 million invested in Australia to design and manufacture these systems and we're talking big bikkies. At the same time we're helping the 1.1 billion Chinese get better connected. And we're certainly no strangers to the global marketplace. Total exports for last year amounted to $200 million. This has helped us become Australia's leading exporter in the telecommunications industry. And so long as that's the way the cookie crumbles, there'll be more export earnings in the future. Alcatel Australia. We're Australia's largest communications company because we know how to compete worldwide.

ALCATEL
AUSTRALIA

LBC&M ALC 0106